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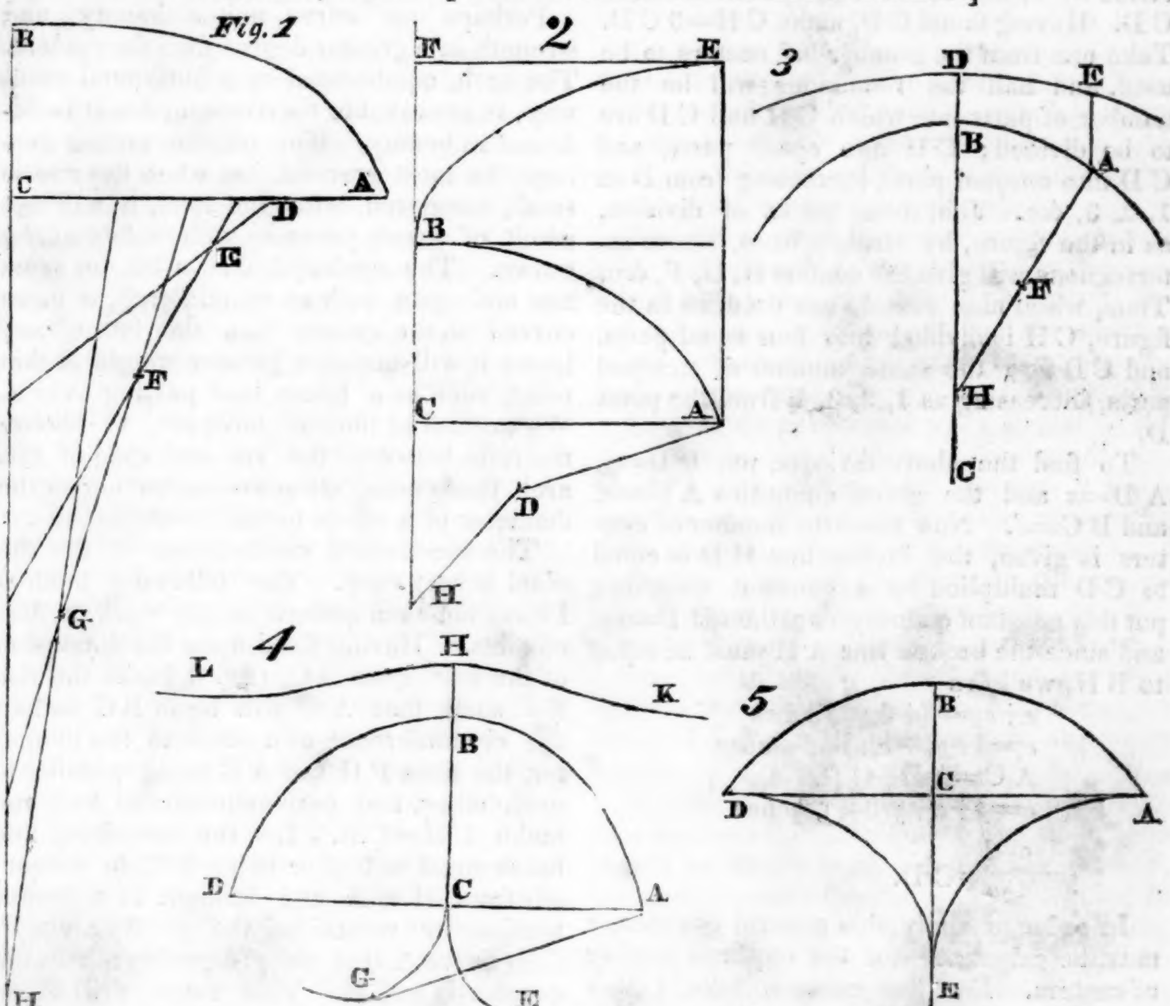
They helped every one his neighbor; and every one said to his brother, Be of good courage: so the carpenter encouraged the goldsmith, and he that smootheth with the hammer him that smote the anvil, saying, It is ready for the soldering; and he fastened it with nails that it should not be moved.—ISAIAH, chap. xli. ver. 6, 7.

On the Methods of describing various Curves for Arches. By J. THOMSON, Civil Engineer, Nashville, Tenn. [From the American Journal of Science.]



MR. EDITOR—The following observations on the methods of tracing various curves for arches are submitted for publication in the American Journal, with the hope that they may be found useful to mechanics, by saving the time and labor of tedious calculation.

The merely practical mechanic, unacquainted with algebraical calculations, is still

uninformed in regard to the method of finding the point D (fig. 1), or the distance C D, the determination of which is the only difficulty he will encounter. The distance C D, in that communication, is only expressed in indefinite parts, and not by means of a quantity derived from the ratio of A C to C B.

In order to find C D, *divide the difference of the rise and half span* of the arch by the following decimal numbers :

For five centers, divide by 0.794.
For seven centers, ' ' 0.771.
For nine centers, ' ' 0.758.
For eleven centers, ' ' 0.749.

The method of finding these divisors will be given hereafter. It may be observed that the last divisor is nearly =0.75, hence when eleven centers are used, multiply the above difference of rise and half span by 4, and divide by 3, the result will be the distance C D. Having found C D, make C H=3 C D. Take one from the number of centers to be used, and half the remainder will be the number of parts into which C H and C D are to be divided; C H into *equal* parts, and C D into *unequal* parts, increasing from D as 1, 2, 3, &c. Join these points of division, as in the figure, by straight lines, whose intersections will give the centers H, G, F, &c. Thus, when nine centers are used, as in the figure, C H is divided into four equal parts, and C D into the same number of unequal parts, increasing as 1, 2, 3, 4, from the point D.

To find the above divisors, put C $D=y$, A $D=x$ and the given quantities A $C=a$, and B $C=d$. Now when the number of centers is given, the broken line H D is equal to C D multiplied by a constant quantity; put this constant quantity $=c$, then H $D=cy$, and since the broken line A H must be equal to B H, we have

$$x+cy=d+3y, \text{ whence}$$
$$x=d+y(3-c), \text{ and since}$$
$$A\,C=A\,D+C\,D,$$
$$a=y+d+y(3-c), \text{ hence}$$
$$y=\frac{a-d}{4-c}=C\,D.$$

In order to apply this general equation, c must be calculated for the required number of centers. For five centers, take C D= any assumed quantity, say three; then by trigonometry we find the sum of the lines that constitute H D=9.619, hence $c=\frac{H\,D}{C\,D}=3.206$. In the same way we find for seven centers $c=3.229$, and for nine centers $c=3.242$, and for eleven centers $c=3.251$. Hence we have for

$$\text{Five centers, } C\,D=\frac{a-d}{0.794}$$
$$\text{Seven centers, } C\,D=\frac{a-d}{0.771}$$
$$\text{Nine centers, } C\,D=\frac{a-d}{0.758}$$
$$\text{Eleven centers, } C\,D=\frac{a-d}{0.749}$$

Since it is thus almost as easy to trace an oval arch with nine or eleven centers as with three, the description of this arch by means of three centers ought always to be avoided, as it is not only disagreeable to the eye, but it is deficient in strength, in consequence of the sudden change of curvature resulting from this mode of description.

Perhaps no curve unites beauty and strength in a greater degree than the cycloid. The arch, equilibrated by a horizontal roadway, is remarkable for strength, but it is deficient in beauty. The elliptic arch is perhaps the most graceful, but when the rise is small, compared with the span, it will not admit of great pressure with safety at the crown. The cycloidal arch, with the same rise and span with an elliptic arch, is more curved at the crown than the latter, and hence it will sustain a greater weight at that point, such as a heavy load passing over it. We are not at liberty, however, to choose the ratio between the rise and span of this arch, these being always to each other as the diameter of a circle to the circumference.

The mechanical construction of the cycloid is very easy. The following method I have not seen noticed in any work on Mechanics. Having fixed upon the dimension of the half span A C, (fig. 2,) take the rise B C such that A C will be to B C as half the circumference of a circle to the diameter, the lines F H and A E being parallel to each other, and perpendicular to A C, and make C H=C B. Let the describing line taken equal to B H or twice B C, be extended from H to A, and brought to a proper tension by means of the point or pin D. The curve A B is then described with the centers D and H. This curve will be an approximation to the cycloid. Fix a number of centers (the more the better) along the curve A B, and with these centers describe the curve B E, which will be a cycloid as near as can be obtained by any mechanical

means. If, instead of a single point, D, three or four points be taken as centers between H and A, so arranged as to be nearly in a cycloidal curve, and keeping at the same time the line A D H at its proper tension, the resulting curve A B will itself be a very near approximation to the cycloid; but not much greater sensible accuracy can be attained in the second curve B E, than when a single point D is first assumed.

The above method of tracing this kind of arch is derived from the principle, that when any curve or broken line A D H is assumed between the parallel lines A E and F H, the successive developments or involutes A B, B E, &c. between the same parallels, constantly approach to, and finally terminate in a cycloid. These involutes converge so rapidly to the form of this curve, that when the above method is adopted, the second involute B E may always be assumed in practice as the required curve.

One advantage that might be mentioned, in tracing curves for arches with a variable radius, is that we may always obtain the height of the road-way above any point in the arch, such that it may be equilibrated by the superincumbent weight. Thus, let D E (fig. 3) represent a road-way passing over the arch A B, let B C=radius of curvature at the point A, D B=height of road-way at the crown, then we have $AE=\dfrac{DB\times BC}{AF\times(\cos AHB)^3}$.

An arch that will require a gentle elevation of road-way at the crown, in order to produce equilibration, may be described by the following method. Let A D, (fig. 4,) represent the span of the arch, B C the rise; describe an arc C G of a circle on D C as a diameter; extend the describing line from A to G, where it is a tangent to the circle; the line being fixed at G, describe the half arch A B with centers arranged along the curve C G, and in the same manner describe the half arch B D with centers on C E. If the span A D be=100, A G will be=70.7, and hence the rise B C will be 40. It will be found from the above equation that this arch will be nearly equilibrated by a roadway of the form of L H K, gradually rising at the crown of the arch, when H B is taken equal to about one-fourth of the rise.

A very graceful arch may be described (fig. 5) by centers arranged along circles tangent to the span and axis of the arch, at the points D, E, and A, E. This arch will also admit with safety a horizontal road-way. The span of this arch will be to the rise as $2r$ to $\frac{1}{4}c-r$, r being the radius of a circle, and c the circumference, or the ratio will be as 1 to 0.2854. The use, however, of arches of this description is limited to cases where we are at liberty to adopt the constant ratio that necessarily exists between their rise and span.

Proposals for constructing a Steam Camel.
By John L. Sullivan, Civil Engineer.
To the Editor of the Mechanics' Magazine.

New-York, April 24, 1833.

Sir,—It will be recollected that the name of *camel* is given to the hollow floats, used to buoy up ships of war to cross barred harbors, especially at Amsterdam.

Wherever the current of a river meets the tide, a shoal is of course formed by the deposition of sediment, and may at length obstruct navigation. All that *art* can do, then, is to contract the passage, and by a more rapid current compel the shoal to form further down stream. The effect of dredging is but partial and temporary. Vessels might be fitted out for foreign voyages, at Albany, and the largest class of coasters come to this port, but for this obstruction.

The *Overslough* is becoming a more sensible impediment to vessels since the increase of the population and trade at this city. Being the seat of government, and the meeting of the lakes and the ocean, it might become very commercial.

In case no permanent work should be devised to remedy the inconvenience of this shoal, it has occurred to me that a *steam camel* is capable of being made, at once to raise and bear vessels of any size over it.

Having acquired the right to the recent improvement made in steamboats by Mr. Blanchard, for the North River Companies, I have invented, by the combination of two of them, with machinery, the instrument to which I have given the name of the *steam camel.*

The *peculiarity* of his boat was essential to its construction. It required that their hulls should be exceedingly light, yet very *stiff*, because vessels sit in the water according to the weight on board, and the displacement that equals it. The greatest weight will be in the broadest part of the vessel, but when she is lifted out that burden is transferred to the buoyant vessels, (or camel,) and will come on them somewhat unequally. And if so, their vertical strength must be such that one end may be depressed without injury to the

other: she must be incapable of changing her vertical shape.

The requisite lightness and stiffness of this vessel is owing to her frame being composed of *arches*. These arches are vertical and opposite, and their ends are connected strongly: they are then braced apart by cross studs, and then tied together by screw bolts close to each stud. Thus combining the strength of the column with the longitudinal strength of the fibre of the wood of the curves.

Two such frames placed parallel and vertical, and resting the inverted arch on the floor timbers, the hull receives any desired model. The ends project far enough to bear up the impelling wheel, which is thus placed at the stern, and others may, for great speed, be placed also at the sides. The cylinders lay horizontal, in connection with the frames, and thus the most vigorous action of the engine can be well sustained. This kind of steamboat draws about *one foot*, all on board. So far as we have experience, her performance is extraordinary. One runs up the Connecticut, over Enfield falls, between Hartford and Springfield; another runs up the Kennebec, from Gardiner, over the rapids, to Waterville. Another has ascended the Alleghany as far as Hamilton, the key to a direct trade with the valley of the Mississippi, from New-York, without the intervention of aid by the laws of other states: probably of future consequence.

Two of these light and stiff steamboats being properly *connected*, yet apart sufficiently to come on both sides the vessel to be assisted, she is lifted as much out of the water as is requisite, by means of their steam power, and the application of the machinery, combined with them, to form the *camel;* and then applying the power to the wheels, she is carried quickly over the shoal. Thus any vessel might load at Albany, and be carried below the shoals, or be brought up, loaded; and sea vessels brought up more easily than to New-Orleans.

The Dutch camel is filled with water, and brought under the sides of the ship, when, on being *pumped out*, they buoy her up; but this is a slow process. The impatient trade of the Hudson requires the most active aid. In five minutes the vessel should be raised, and in ten more set down. The specification of this improvement is too long for insertion in this place. This notice serves merely to show that the nature of the shoal is such as not to permit of a radical remedy, but may be thus practically surmounted.

JOHN L. SULLIVAN, Civil Engineer.

[From the American Railroad Journal.]

IMPROVEMENTS IN PENNSYLVANIA.—Internal improvements in this state are progressing with extraordinary rapidity. It appears from the report of the Canal Commissioners, read in Senate Dec. 6, 1832, that, of the works constructed by the State, there are

completed in canals now navigable, *miles*	479½
In hand and likely to be completed during the present year,	103½
Independently of these, there are others constructed at the expense of corporations, and now in actual use,	280¼
Thus on the 1st January, 1834, the total of navigable canals will be	863¼

In the construction and completion of railroads, great progress is making also. We learn that there are 415½ miles either completed, or progressing so fast that nearly all will be completed during the present year. Independent of this, other companies are forming.

In the 14th number of the 2d volume of this Journal, for March 5th, will be found an interesting letter from Mr. Edmund S. Coxe, of Philadelphia, giving a description of some of the improvements going on, but as we conceive a more detailed list would not be uninteresting to our readers, we shall lay before them a complete list of railroads and canals, finished and unfinished, the greater part of which we copy from the Philadelphia Commercial Herald.

CANALS CONSTRUCTED BY THE STATE.

1. Canal from Columbia, on the Susquehannah, to the mouth of the Juniata, and up the Juniata to Hollidaysburg, at the eastern base of the Alleghany mountain—distance 171 miles 246 perches.

2. Canal from Johnstown, on the Conemaugh, at the western base of the Alleghany, down the Conemaugh, Kiskeminetas and Alleghany, to Pittsburg—distance 105 miles. [The above lines, connected by the "Portage Railroad," over the mountain, form the great east and west communication. It has a double connection with Philadelphia, one from Columbia, by way of the Pennsylvania Railroad, and the other from Middletown, nine miles below Harrisburgh, and eighteen miles above Columbia, by the Union Canal.]

3. Canal from the mouth of the Juniata up the Susquehannah to the forks at Northumberland, then up the north branch to a point 2 miles below Wilkesbarre. Distance 96 miles 295 perches. [It is contemplated to extend this at some future day to the north

line of the state, when a communication by canal and railroad will take place with the Erie Canal.]

4. Canal from Northumberland, at the forks of the Susquehannah, up the west branch to the Muncy dam—distance 26 miles 160 perches. [For extension see below.]

5. The French creek feeder, intended to supply with water the future communication between the Ohio and Lake Erie—length 19 miles.

6. A canal from Bristol to Easton, on the Delaware—length 59 miles 240 perches. [This is the channel by which the coal trade of the Lehigh reaches Philadelphia.]

CANALS CONSTRUCTED AT THE EXPENSE OF CORPORATIONS, AND NOW IN ACTUAL USE.

7. The Union Canal, from the Schuylkill opposite Reading, to the Susquehannah at Middletown—length 82 miles 88 perches. Branch Canal and feeder, belonging to the Union Canal Company, 22 miles in length, with a railroad of four miles to the Pine Grove coal mines.

8. The Schuylkill Navigation, from Port Carbon on the Schuylkill to Philadelphia—length 108 miles.

9. The Lehigh Canal, from Easton on the Delaware up the Lehigh to Mauch Chunk—distance 46 miles.

10. A part of the Hudson and Delaware Canal, from Honesdale on the Lackawaxen to the mouth of that stream—supposed 20 miles.

11. Conestoga Navigation, an improvement of Conestoga creek by locks and dams from its mouth up to the city of Lancaster—distance about 14 miles.

12. The Codorus Navigation, an improvement of Codorus creek from its mouth up to the borough of York—length about 10 miles.

Total of canal navigation now in use, 759¾ miles.

The canals authorized and now in progress at the expense of the State, and likely to be navigable by the end of this year, are

From Muncy dam on the West Branch up that river to the mouth of Bald Eagle creek. Distance 40 miles and 18 perches. [This is an extension of No. 4, and will complete the improvement contemplated in that quarter.]

From two miles below Wilkesbarre up the north branch of the Susquehannah to the mouth of the Lackawanna—distance 12 miles 316 perches. [This is an extension of No. 3, and will leave about 90 miles towards the north line of the State untouched.]

From the confluence of the Beaver with the Ohio, (20 miles below Pittsburg,) up the former river to Newcastle—distance 24 miles 240 perches. [This is the commencement of a communication between the Ohio and Lake Erie, which will pursue a northerly direction up the valley of the Chenango to the summit at Conneaut lake, thence to Lake Erie, at the town of Erie. At the Conneaut summit it will be supplied with water from French creek, by a feeder described above as No. 5. From Newcastle to Erie, by the route selected, will be about 78 miles.]

A canal and slackwater along French creek, from the commencement of the feeder to the junction of that creek with the Alleghany—distance 25 miles 224 perches. [This work does not form a part of any great communication.]

By this statement it appears that after the present year only 90 miles on the north branch of the Susquehannah river, and 78 miles between the Ohio and Lake Erie, will remain to complete the whole system of improvement adopted by the State of Pennsylvania, and upon which operations commenced in the summer of 1826, less than seven years ago. That system will embrace when completed:

1. A great line of communication from Philadelphia, passing by Lancaster, Columbia, Middletown, Harrisburgh, Lewistown, Huntingdon, Hollidaysburg, Johnstown, Blairsville, Pittsburg, Beaver, Newcastle, and Meadville, to the Borough of Erie, on Lake Erie. The whole distance 481 miles, of which 118 miles is by railroad, 20 miles by the Ohio river, and 343 miles by canal. Distance from Philadelphia to Pittsburg 358 miles. [This passes through the great iron region of the Juniata, the salt and bituminous coal of the Conemaugh, Kiskeminetas, and Alleghany, and a country abounding in agricultural product.]

2. A great line from Philadelphia to the junction of the Tioga with the north branch of the Susquehannah, on the boundary of New-York, where a communication is now forming with the Erie Canal, by way of Chenango Point. This line diverges from the former at the mouth of the Juniata, and passes Liverpool, Selin's Grove, Northumberland, Danville, Berwick, Wilkesbarre, Pittston, Towanda, and Athens. It passes through

the Wyoming coal region, and opens a rich agricultural country to market. Whole distance 324 miles, of which 81 miles are by railroad, and 234 by canal—common to the great western route, 81 miles of railroad and 43 of canal.

3. The West Branch Canal, from the mouth of Bald Eagle to the Forks at Northumberland, where it unites with the line last mentioned. It opens the richest land in the State, the valuable iron of Bald Eagle valley, and the inexhaustible beds of bituminous coal on the West Branch and its tributaries. These articles will have their choice of markets between Philadelphia and the interior of New-York, where both are needed.

4. The Improvement of French creek and the Delaware Canal, which at present are rather detached works than parts of any great system of communication.

This brief summary, including all the works undertaken or contemplated by the State, is sufficient to show that the Pennsylvanian system of improvement is simple in itself, and that almost every part is necessary to the perfection of the whole. By an examination of the map it will appear that every important section of the State, which it was practicable to reach, has been brought into communication with the city of Philadelphia. The counties on the southern border, whose waters run into the Potomac and Monongahela, are alone excluded—and that by the operation of paramount natural causes.

RAILROADS.

1. Pennsylvania Railroad, constructed at the expense of the State, from Broad street, Philadelphia, to the Susquehannah at Columbia, and there joining the Southeast termination of the State Canal,—distance 81½ miles —30 miles being in actual use, and the whole in a fair way to be finished this year.

2. Portage Railroad—constructed by the State—across the main Alleghany mountain by a series of inclined planes, connecting the Juniata at Hollidaysburg with the Conemaugh, at Johnstown—distance 36 69-100 miles, including a tunnel of 900 feet long, four large viaducts, and other works of great magnitude. This unites the Eastern Canal with the Western, and will complete the line of communication between Philadelphia and Pittsburg. A great part of this work is now completed, and will be in use next year.

3. The West Chester Railroad* is a branch from the Philadelphia Railroad to the flourishing village of West Chester. It unites with the Pennsylvania Railroad on the South Valley Hill, two miles west of Paoli. It is the property of a Company composed of enterprizing citizens of Philadelphia and West Chester. Length nine miles—cost about $100,000. Completed, and now in use.

4. The Philadelphia, Germantown, and Norristown Railroad. The line begins at the intersection of Spring Garden and Ninth streets, and terminates at Norristown. Six miles of this distance are completed, and now in use. Preparations are making to finish the remainder. Made at the expense of a company.

5. Little Schuylkill Railroad. From Port Clinton, at the mouth of Little Schuylkill, to the village of Tamaqua, on that stream —distance 21½ miles, with several branches to coal mines. This is the work of a company, and is designed, principally, to transport coal to the Schuylkill navigation. Finished and in use.

6. Mine Hill and Schuylkill Haven, at the mouth of the West Branch of Schuylkill, up that stream 10½ miles to Mine Hill Gap. Finished and in use. Trade, coal. Belongs to a company.

7. Mount Carbon Railroad. From Mount Carbon, one mile below Pottsville, up the valley of the Norwegian creek—main line and branches about seven miles. Finished and in use. Trade, coal. Belongs to a company.

8. Danville and Pottsville Railroad. From Pottsville to Sunbury, opposite the forks of the Susquehannah. Length 45 miles—eight miles nearly completed. It is designed to accommodate the great coal region on the Shamokin, Mahoney, &c. and to connect the Susquehannah with the Schuylkill canal. Belongs to a company.

9. Schuylkill Valley Railroad. From Port Carbon at the head of the Schuylkill navigation, up that river to the town of Tuscarora—distance 10 miles. Trade, coal. Belongs to a company. Finished and in use.

10. The Mauch Chunk Railroad. The first of any magnitude completed in the United States. From the head of the Lehigh Canal at Mauch Chunk, to the coal mine on the summit of Mauch Chunk mountain. Aggregate of main line and branches, 12¾ miles. Belongs to the Lehigh Coal and Navigation Company.

11. The Roan Run Railroad. From Mauch Chunk, up the Lehigh to a Coal

* See Railroad Journal, No. 5. Vol. 2.

Mine—length 5¼ miles. Finished and in use. Belongs to the above company.

12. Lyken's Valley Railroad. From Millersburgh to the Susquehannah, up Lyken's Valley, to a Coal Basin in the Broad Mountain. Distance 16½ miles. Begun, and will be completed this year.

13. Carbondale Railroad. Belongs to the Hudson and Delaware Canal Company, and connects that work with the Coal Mines in the valley of the Lackawanna. Length of road 16¼ miles. Finished and in use.

14. The Philadelphia and Trenton Railroad. From Philadelphia to the Delaware Bridge, near Trenton. Distance 27½ miles. The line is located, and contracts made for grading and bridges. To be finished this year. The rails will be laid next year. Belongs to a company, and is designed to accommodate transportation between Philadelphia and New-York.

The above list is believed to comprise all the important Railroads in Pennsylvania, actually finished, or upon which arrangements have been made for their early completion. Some smaller or branch lines have been probably overlooked. There are also several very important works which have been authorized by law, and which there is reason to hope will be soon commenced. Of this class are the Williamsport, and Elmira, and Phillipsburg, and Juniata Railroads. We have not named the York and Baltimore Railroad, as we believe that portion of it which lies in Pennsylvania has not been commenced.

Among other documents connected with these interesting subjects, we have been favored with a report of a survey made by Mr. R. Taylor,* Engineer, with a view of forming a railroad from the coal and iron mines near Blossburg, to the state line at Lawrenceville, a distance of twenty-six miles. Mr. T.'s report is rendered exceedingly interesting by the numerous tables and descriptions it contains of the various mineral sections of the mining districts surrounding Blossburg. Speaking of the mineral resources of the Tioga Valley, after giving a detailed account of those sections, showing the position and thickness of the respective beds of coal, iron, fine clay, sand stone, slate, shell, and other strata, he thus proceeds:

"In taking a general view of this district it will be seen that the valley of Blossburg forms a kind of central point or area, from whence diverge, irregularly, a number of smaller valleys or deep ravines. All these valleys, to the number of twelve, rise with a rapid inclination above the level of this area, until they intersect the mineral strata of the surrounding mountains, at elevations, between the lowest and the highest, of from 200 to more than 380 feet, the prevailing elevation of the summits or table lands being 500 or 600 feet above Blossburg bridge. Coal and iron ore of different qualities prevail extensively, and, when thus intersected by deep ravines, occur under the most favorable known circumstances for mining, and for transmission upon railroads.

"Almost every valley is capable of maintaining its separate branch railroad, and of conveying its contribution of these important products to the principal line.

"The series of mineral strata are estimated to be crossed by the Tioga river at from 5 to 8 miles east from Blossburg. The examination has been thus far pursued, and traces of minerals are discernible throughout that distance; but as the river passes through gravelly alluvial bottoms, where the banks are not washed or exposed, their examination was left in an incomplete state. The whole inclination is perfectly practical for railroad purposes, whenever it should be thought necessary to locate one down the valley.

"At the forks near Fishing Camp, about five miles up the Tioga, this river is joined by Fellow's creek, which traverses another section of this district from the northeast. The upper part of this ravine is crossed by three falls, in succession, descending about one hundred feet. Below them are numerous indications of the proximity of coal and iron, but the banks are too much obscured by alluvial deposites to exhibit the precise sites of the mineral beds on a single examination. Several small ravines descending into this branch, and into Morris' Run, contain traces of coal.

"On the east side of the Tioga, nearer Blossburg, are the four principal ravines of East Creek, Bear Creek, Coal Run, and Morriss' Run. There are two or three other ravines in the same direction, where the coal beds are approachable. On the west are the two ravines of Boon's Creek and Johnson's Creek.

* Report on the Surveys undertaken with a view to the establishment of a Railroad from the coal and iron mines near Blossburg, or Peters's Camp, to the State line at Lawrenceville, in the county of Tioga, and the state of Pennsylvania, and Mineralogical Report on the coal region in the environs of Blossburg. By Richard C. Taylor, Engineer. Philadelphia, Mifflin and Parry. 1833.

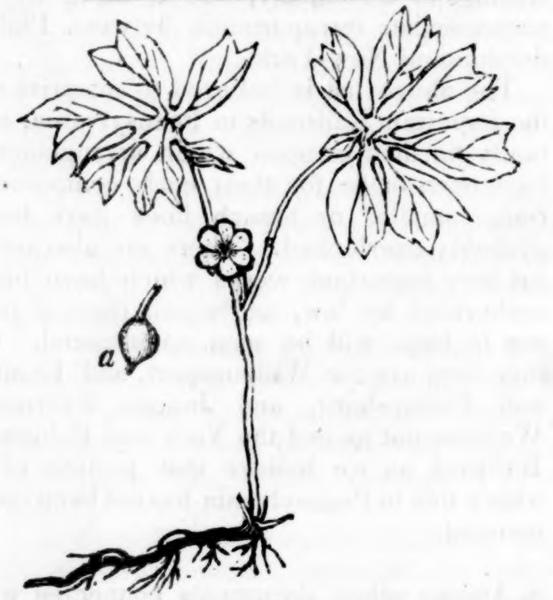
"Three miles below Blossburg there is a regular dip, at the rate of 260 feet to the mile southward, which increases until at 17 miles it is about 500 feet in a mile, and then decreases to 200 feet per mile, at the State line, or 26 miles.

"If we pursue this examination for the sake of a more extended geological result, our position will be yet further strengthened.

"At 33 miles below Blossburg, the southern dip is 168 feet in each mile; and at 38 miles, near the Painted Post, was found to be 130 feet. At 42 miles, at the Chimney Narrows, in the same parallel, near the entrance of the Chemung feeder, this dip is about 100 feet, making the aggregate southern depression of the strata about 1050 feet more to this point, to be added to 70 feet, the descent of the land from the state line. Uniting, therefore, these sums with those before observed in the Pennsylvania division, the altitude of any land or mountains near the Chimney Narrows, capable of containing the veins of the Tioga coal field, must be more than 6000 feet, whereas they do not commonly exceed 600 feet; or by reversing the position, the stratum of rock on a level with the river of Chimney Narrows would be about 6275 feet below the summit of East Hill, if prolonged so far to the south. I may add that I have had an opportunity of extending the examination 60 miles further, or more than 100 miles from the coal beds, to the north and north-east; and a general observation may be made, that wherever a horizontal position [which often prevails] is not maintained throughout this parallel, there exists a depression pointing towards the Tioga coal district, or, generally, south. Consequently there is no probability that any portion of these mineral beds are prolonged in that direction, and, as has been before suggested, we must continue to regard the district which is the more immediate subject of our investigation, and from which I have somewhat wandered, as the real termination of the great Alleghany coal field."

Mr. Taylor's report is drawn up with great ability, and is of itself evidence of great industry and perseverance on his part. We sincerely hope that this most important plan will very soon be added to the list of works in active operation, feeling confident that it will materially benefit the commercial interest of Pennsylvania.

Co-operation of Schools.—The Convention of Teachers now in session at Andover have entered promptly and warmly into measures to co-operate with the School Agent Society. The plan of a general co-operation of schools throughout the Union, by collecting and exchanging specimens of Natural History, Journals of the Weather, &c. was fully developed and unanimously approved. It was particularly proposed that each school should note the number of rainy and clear days, and occasionally give them to the public, and have them brought together in some journal in such a way that they could be compared. By this means, the citizens of New-Orleans, St. Louis, Columbus (O.), Quebec, Boston, New-York, Charleston (S. C.), and Savannah, could compare the state of the weather, from month to month, and for the whole year.



Podophyllum Peltatum (*May Apple.*) By Q. Z. [From the New-York Farmer.]

Polyandria Monogynia, of Linnæus.

Ranunculaceæ, of Jussieu.

Calyx, three-leaved; corolla, about nine-petalled; stigma large, crenate, sessile; berry, one-celled, crowned with the stigma, large, many seeded; columella, one-sided.—*Eaton.*

Stem, one-flowered; leaves, peltate, palmate, lobate; lobes, cuneate, incised.—*Barton's Com. Flo. Phil.*

Podophyllum is derived from two Greek words πους, a foot, and φυλλον, a leaf, in allusion to the resemblance of the leaf to the web-foot of aquatic birds. This species, the May apple, is a common plant in many sections of our country, from the Canadas to Florida. It is found on the borders of rich shady woods, and by the sides of rivulets of water. The root is creeping, and grows from three to six feet in length. The whole plant is about a foot high. It consists of two leaves on a single stem, which, in the

junction formed by the footstalks of the leaves, supports a flower, and afterwards a fruit. The flower is white, the stamens yellow, from thirteen to twenty in number. The fruit (*a*) is lemon-colored, is about the size of a common garden plum, possessing when ripe an acidity and flavor by most persons highly esteemed. It is "exclusively a native of North America," blooming in the Middle States in May, and ripening its fruit in September.

Medicinal Properties.—The root of this plant is highly valued for its medicinal properties. "There is no indigenous plant whose virtues are better ascertained at present. Its proper place in the materia medica is among *cathartics*, and it may be ranked among the most safe and active of this class of medicines;"* the dose is a tea-spoon-full of the pulverized root, taken in sugar water or any other convenient form. Q. Z.

Newburgh, March, 1833.

Architecture.—Without entering deeply into the subject of Architecture, we propose to devote a portion of our succeeding pages to the explanation of the general and fundamental principles upon which this highly interesting and beautiful science depends.

The science of Architecture has at all times, and in all civilized countries, been considered not only a pleasing but a highly useful branch of knowledge.

The great utility of this science, and the elegant accomplishments connected with its study, have almost rendered a knowledge of its rules and principles necessary to complete a liberal education. But it is not our intention to bestow encomiums on the science, nor to give any thing like a detailed history of it, but to present our readers with a plain and condensed account of what may be termed its elementary principles.

Architecture is usually divided, with respect to its objects, into three branches, *civil*, military, and naval.

Civil Architecture, called also absolutely, and by way of eminence, *Architecture*, is the art of contriving and executing commodious buildings for the uses of civil life; as houses, temples, theatres, halls, bridges, colleges, porticoes, &c.

Architecture is scarcely inferior to any of the arts in point of antiquity. Nature and necessity taught the first inhabitants of the earth to build themselves huts, tents, and cottages; from which, in course of time, they gradually advanced to more regular and stately habitations, with variety of ornaments, proportions, &c. To what a pitch of magnificence the Tyrians and Egyptians carried *Architecture*, before it came to the Greeks, may be learned from Isaiah xxiii. 8. and from Vitruvius's account of the Egyptian Oeci; their pyramids, obelisks, &c.

Yet, in the common account, *Architecture* should be almost wholly Grecian original: three of the regular orders or manners of building are denominated from them, viz. *Corinthian*, *Ionic*, and *Doric*: and there is scarcely a single member, or moulding, but comes to us with a Greek name.

Be this as it may, it is certain the Romans, from whom we derive it, borrowed what they had entirely from the Greeks; nor do they seem, till then, to have had any other notion of the grandeur and beauty of buildings, beside what arises from their magnitude, strength, &c. Thus far they were unacquainted with any other beside the *Tuscan*.

Under Augustus, *Architecture* arrived at its glory: Tiberius neglected it, as well as the other polite arts. Nero, amongst a heap of horrible vices, still retained an uncommon passion for building; but luxury and dissoluteness had a greater share in it than true magnificence. Apollodorus excelled in *Architecture*, under the emperor Trajan, by which he merited the favor of that prince; and it was he who raised the famous Trajan column, existing to this day.

After this, Architecture began to dwindle again; and though the care and magnificence of Alexander Severus supported it for some time, yet it fell with the western empire, and sunk into a corruption, from whence it was not recovered for the space of twelve centuries.

The ravages of the Visigoths, in the fifth century, destroyed all the most beautiful monuments of antiquity; and *Architecture* thenceforward became so coarse and artless, that their professed architects understood nothing at all of just designing, wherein its whole beauty consists: and hence a new manner of building took its rise, which is called the *Gothic*.

Charlemagne did his utmost to restore *Architecture*; and the French applied themselves to it with success, under the encouragement of H. Capet: his son Robert succeeded him in this design, till by degrees the modern *Architecture* was run into as great an excess of delicacy, as the Gothic had be-

* Barton's Medical Botany, vol. 2, p. 14.

fore done into massiveness. To these may be added, the Arabesk and Morisk or Moorish *Architecture*, which were much of a piece with the Gothic, only brought in from the south by the Moors and Saracens, as the former was from the north by the Goths and Vandals.

The architects of the 13th, 14th, and 15th century, who had some knowledge of sculpture, seemed to make perfection consist altogether in the delicacy and multitude of ornaments, which they bestowed on their buildings with a world of care and solicitude, though frequently without judgment or taste.

In the two last centuries, the architects of Italy and France were wholly bent upon retrieving the primitive simplicity and beauty of ancient *Architecture;* in which they did not fail of success: insomuch, that our churches, palaces, &c. are now wholly built after the antique. *Civil Architecture* may be distinguished, with regard to the several periods or states of it, into the antique, ancient, gothic, modern, &c. Another division of *Civil Architecture* arises from the different proportions which the different kinds of buildings rendered necessary, that we might have some suitable for every purpose, according to the bulk, strength, delicacy, richness, or simplicity required.

Hence arose five orders, all invented by the ancients at different times, and on different occasions, viz. Tuscan, Doric, Ionic, Corinthian, and Composite. The Gothic Architecture may also be mentioned here, for it is perfectly distinct both from the Grecian and Roman style, although derived from the latter. [*To be continued.*]

History of Chemistry. [Continued from No. 4, page 209.]

Chemists had for many ages hinted at the importance of discovering a universal remedy for all diseases, and several of them had asserted that this remedy was to be found in the philosopher's stone. This notion gradually gained ground; and the word Chemistry, in consequence, at length acquired a more extensive signification, and implied not only the art of making *gold*, but also of preparing the universal Medicine. The first person who formally applied Chemistry to medicine was Basil Valentine, who was said to be born in 1394, at Erfurd, in Germany.

Just about the time that the first of these branches was sinking into discredit, the second, and with it the study of *Chemistry*, acquired an unparalleled degree of celebrity, and attracted the attention of all Europe. This was owing to the appearance of Theophrastus Paracelsus, who was born in 1493, near Zurich, in Switzerland, and was in the 34th year of his age appointed to read lectures on Chemistry in the city of Basil. He was the first Professor of Chemistry in Europe.

Van Helmont, who was born in 1577, is considered as the last of the Alchymists. His death completed both the disgrace of the philosopher's stone and the universal medicine.

The foundation of the alchymical system being thus shaken, the facts which had been collected soon became a mere chaos, and Chemistry was left without any fixed principles, and destitute of any object. But fortunately, about this time arose a person completely acquainted with the whole of these facts, and rescued this branch of science from the oblivion into which it would soon have fallen. This person was the celebrated Beccher. He accomplished the arduous task in a work entitled *Physica Subterranea*, published at Frankfort in 1669. The publication of this book forms a very important era in the history of Chemistry, as it contains the rudiments of the science as taught at the present day. After the death of Beccher, Ernest Stahl, the editor of the Physica Subterranea, adopted and taught the theory of his master: but he simplified and improved it so much that he made it entirely his own, and accordingly it has been known ever since by the name of the *Stahlian Theory*.

Ever since the days of Stahl, Chemistry has been cultivated with ardor in Germany and the *North of Europe*. The most celebrated men which these countries have produced are Margraf, Bergman, *Sheel*, and Klaproth.

In France, soon after the establishment of the Academy of Sciences in 1666, Homberg, Geoffrey, and Lemery, acquired great celebrity by their chemical experiments and discoveries.

From that time chemistry became the fashionable study in France, and men of eminence appeared every where; discoveries multiplied; the spirit for chemical research pervaded the whole of that kingdom, and extended itself over the continent of Europe. After the death of Boyle, and some of the other *early* members of the Royal Society of London, little attention was paid to Chemis-

try in Britain, except by a few individuals, But when Dr. Cullen was appointed Professor of Chemistry in the University of Edinburgh, in 1756, he kindled a flame of enthusiasm among the students, which soon spread through the kingdom; and, after this, soon followed the important discoveries of Dr. *Black*, *Cavendash*, and *Priestly*, which, joined to the discoveries made in France, Germany, and Sweden, made the science of Chemistry burst forth at once with unexampled lustre. Hence the rapid progress it has made during the last thirty years, the universal attention which it has excited, and the unexpected light it has thrown on almost every useful art.

Having thus given a short but comprehensive view of the history of Chemistry down to our own times, we shall conclude this article by taking a retrospective view of some of the most distinguished THEORIES of the ANCIENTS, the various modifications which they have undergone at different times, and the steps by which chemists have been led to the opinions which they hold at present.

It seems to have been an opinion established among the most ancient philosophers, that there are only *four* simple bodies, out of which all others are formed, or to which all others may be reduced, viz. *fire*, *air*, *earth*, and *water*. To these they gave the name of *Elements*.

This opinion, variously MODIFIED, was maintained by *all* the ancient philosophers. It is, however, well known now that all these supposed *elements* are compounds, if we except fire.

Air is a compound of oxygen and nitrogen; water, of oxygen and hydrogen; and earth, of many different substances.

The doctrine of the four elements seems to have continued undisputed till the time of the Alchymists.

This class of men having made themselves much better acquainted with the analysis of bodies than the ancient philosophers were, soon perceived that the common doctrine was insufficient to explain all the appearances which were familiar to them. They therefore substituted a theory of their own in its place. According to them there are *three elements* of which all bodies are composed, namely, *salt*, *sulphur*, *and mercury*, which they distinguished by the appellation of the *tria prima*. These principles were adopted by succeeding writers, particularly by Paracelsus, who added two more to their number, namely, phlegm and *caput mortuum*.

It is not easy to say what the alchymists meant by *salt*, *sulphur*, and *mercury*; it is probable they had affixed *no precise* meaning to the words.

Every thing fixed in the fire (*i. e.* on which the fire had little or no effect) they called *salt*; every inflammable substance they called *sulphur*; and every substance which flies off without burning was *mercury*. Accordingly, they tell us that all bodies may be decomposed by fire, into these three principles; the salt remains behind fixed, the sulphur takes fire, the mercury flies off in the form of smoke. The phlegm and *caput mortuum* of Paracelsus were the *water* and *earth* of the ancient philosophers.

Mr. Boyle attacked this hypothesis in his *Sceptical Chemist*, and in several *other* of his publications, and proved that the Chemists comprehended under each of the terms salt, sulphur, mercury, phlegm, and earth, substances possessed of very *different properties*; and that these principles themselves are not *elements*, but *compounds*.

Mr. Boyle's refutation was so complete, that the hypothesis of the *tria prima* seems to have been almost immediately abandoned by *all* parties. About this time a very different hypothesis was proposed by Beccher, in his *Physica Subterranea*, which has been already mentioned.

To this hypothesis we are indebted for the present *state* of the *science*, because he first pointed out chemical ANALYSIS, as the true method of ascertaining the *elements* of bodies.

According to him all terrestrial bodies are composed of *water*, *air*, and three earths, viz. the fusible, the *inflammable* or sulphurous earth, and the *mercurial*. The different combinations of these, with a universal *acid* (which he believed to be composed of *fusible earth* and *water*), composed all the different substances which are to be met with in nature.

Stahl modified the theory of Beccher considerably. He seems to have admitted the universal acid as an element; the mercurial *earth* he at last discarded altogether, and to the *sulphurous earth* he sometimes gave the name of *ether*.

Earths he considered as of different kinds, but all of them as containing a certain element called *earth*. So that according to him there are *five elements*: air, water, phlogiston, earth, and the universal acid. He speaks too of *heat* and *light*; but it is not clear *what* his opinion was respecting them.

Stahl's theory was gradually modified by succeeding chemists.

The universal acid was tacitly discarded, and the different *known acids* were considered as distinct, undecomposed, or simple substances: the different earths were distinguished from each other, and all the metalic *calces* were considered as distinct substances.

For these important changes Chemistry was chiefly indebted to Bergman. While the French and German chemists were occupied with theories about the universal acid, that illustrious philosopher and immortal friend of Bergman's (Scheele of Sweden) loudly proclaimed the necessity of considering every undecomposed body as simple until it has been decomposed, and of distinguishing all those substances from each other which possess distinct properties.

Thus the elements of *Stahl* were, in fact, *banished* from the science of Chemistry, and in place of them were substituted a great number of bodies, which were considered as *simple*, because they had not been analyzed. These were phlogiston, acids, alkalies, earths, metals, metalic calces, water, and oxygen.

The rules established by Bergman and Scheele are still followed; but subsequent discoveries have shown that most of the bodies which they considered as *simple* are really compounds, while several of their *compounds* are now placed among *simple bodies*, because the doctrine of phlogiston (in which they believed) is now entirely abandoned.

The true etymology and origin of the word Chemistry is absolutely unknown. Both are enveloped in mystery, and lost in the darkness of ages past. Some historians of this science suppose its name derived from the word Kema, the pretended book of secrets, entrusted to women by the demons; others derive it from Cham, the son of Noah, from whom Egypt received the name of Chemia, or Chamia; some attribute it to Chemnis, king of the Egyptians; and others deduce it from a Greek word, which signifies *juice*, because they suppose it to have commenced with the art of preparing juices, or from another Greek word, to *melt*, because, according to them, it is the daughter of the art of smelting the metals.

Authors have been almost as much at variance with respect to the definition as to the origin and etymology of chemistry. Some have confined it only to the art of examining, extracting and purifying bodies, particularly metals; others have only considered it as that of preparing remedies. It is only since the middle of the eighteenth century that chemistry has been considered the science which ascertains the principles of which bodies are composed, and their different properties. But even this last definition is not accurate, because it neither comprises all the productions of nature, the principles of some of which are unknown, nor all the means of the science, which are not confined merely to the separation of the constituent parts of bodies.

The true definition which ought to be given in the present state of the sciences is much more general. The following may be adopted: Chemistry is a science by which we become acquainted with the intimate and reciprocal action of all the bodies in nature, upon each other. By the words intimate and reciprocal *action*, the science is distinguished from experimental philosophy, which only considers the exterior properties of bodies, possessing a bulk or mass capable of being measured; whereas Chemistry relates only to the interior properties, and its action is confined to particles whose bulk and mass cannot be subjected to admeasurement or calculation. The action of the same cause may, by a change of circumstances, pass from being an object of the one of these sciences to become that of the other. The action of heat, when it expands or contracts the dimensions of bodies, belongs to natural philosophy; when the same power burns and consumes bodies, its action belongs to chemistry. When it converts water into steam, it may belong to either science.

The object of Chemistry is to ascertain the ingredients of which bodies are composed; to examine the compounds formed by the combination of these ingredients; and to investigate the nature of the power which occasions these combinations.

The science, therefore, naturally divides itself into three parts: 1st, A description of the component parts of bodies, or of *simple substances*, as they are called. 2d, A description of the compound bodies formed by the union of simple substances. 3d, An account of the nature of the power which occasions these combinations. This power is now known in Chemistry by the name of *affinity*.

All the bodies in nature, considered in regard to the manner in which they are affected in chemical operations, present themselves to us either as simples or compounds; that is, such as have not yet been decomposed, and such as have been analysed, or separated into others less composed, or complex. Whenever, therefore, we use the phrase *simple bodies* in Chemistry, the term

is to be understood only of bodies not yet decomposed. We cannot assert that those bodies are really simple in themselves, or that they are not formed of other elements still more simple. We can only affirm that, in all the experiments which have been made, these bodies are found to act as if they were simple; that they cannot be decomposed by any process yet known; and that they can only be combined with other bodies, or made to form a component part of a compound body.

Natural bodies, considered under this point of view, present to chemists a very different aspect from what they did to those who held a different doctrine. Most of those bodies, which were formerly considered as simple and as the elements of all other bodies, are found to be more or less compounded; while many of those that were formerly considered as compounds are incapable of being decomposed, and can only be ranked among simple bodies.

The simple substances at present known amount to about *fifty*. These are divided by Dr. Thomson into two classes, which he names *confineable* and *unconfineable* bodies. By the first he means solids and liquids; and by the last airs and gases, heat, light, &c. The former may be exhibited in a separate state, but the latter cannot; and their existence is inferred merely from certain appearances which the first class of bodies, and their compounds, exhibit in particular cases, and under peculiar circumstances. It is therefore obvious, that an acquaintance with the properties of the first set of bodies is necessary in order to be able to investigate those of the second. We shall, therefore, consider these two classes separately.

But to form a classification of chemical facts, at once adapted to lead the student by *easy* and *certain* steps to a knowledge of this science, and at the same time conformable to the strict rules of philosophical arrangement, is attended with very great difficulty. For the science of Chemistry being chiefly confined to the investigation of the laws which bodies observe in combining together, or in separating from each other, it is impossible to enumerate the properties of any one substance which ought to be selected as the first object of investigation, without tracing the effects of many other bodies upon it, which must of necessity be previously known. The action of certain bodies is, however, much more general and extensive than that of others. It therefore appears to be the most natural order of considering this complex and extensive science, to begin by describing the properties and effects of one of the most important and singular substances in nature, which is *oxygen*.

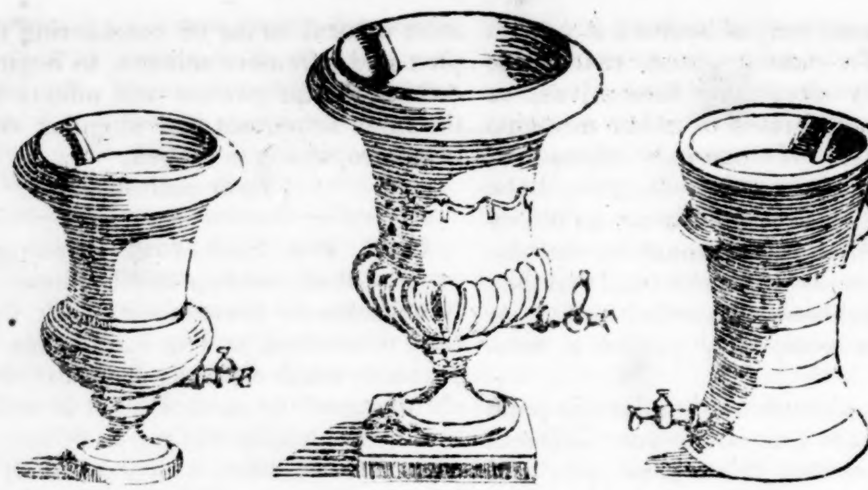
[*To be continued.*]

Clay for Sculptors.—Sculptors, who prepare their models in clay, have frequently occasion to leave their work for a long time unfinished, and in such cases often experience much difficulty from the drying and shrinking of the material. It is well to know that by the addition of ten to fifteen per cent. of muriate of lime, well worked or kneaded into the clay, it will be preserved for almost any length of time in a moist state, and fit for a renewal of the work without any preparation.—[Jour. des Connais. Nov. 1832.]

Pure Water.—Mr. Sullivan and Mr. Disbrow have obtained a joint patent for an improvement in the art of raising water from the interior of the earth, and have published a pamphlet, supplemental to Col. Clinton's Report, pointing out the advantages of forming a Rock Water Company,* in New-York city, for which purpose they have constructed machines and implements of which they are patentees, and several successful experiments have been made. Water is of such vast importance to the community, that we think the corporation of this city would render a very acceptable service to their constituents, by granting the petition of these gentlemen, or at least that part of it which prays that citizens might be *allowed* to supply themselves in the proposed way—which, it appears from the following extract from the pamphlet, cannot at present be done, without permission from the corporation:

"The command of an unlimited supply from the rock places New-York before Philadelphia in respect to this article, as we believe will be evident from the facts to be stated. The subject is therefore one of great public interest, though this *mode* is as yet a private concern; nor is it one that can be carried into effect without an act of incorporation which will enable those to take the water

* An Address to the Mayor, the Aldermen, and Inhabitants of the city of New-York, supplemental to Col. Clinton's Report, on Water, demonstrating, from the facts ascertained by the surveys, as well as others, the advantages of a Rock Water Company, with banking privileges, appropriating the surplus to public baths, and cleansing streets; also, a proposition to the Manhattan Company to fill their Aqueduct with Rock Water. By John L. Sullivan, Civil Engineer, and Co-Patentee with Levi Disbrow. New-York, Clayton and Van Norden.



who please to do it, and that those who yet have good wells be *exempt* from a *water tax*. This is indeed the case with several quarters where Mr. Disbrow has made borings for the corporation. But it is thought best now, for the public accommodation, to put the privilege of our patents, for this branch of usefulness, into the hands of a company, who may have a motive to give the utmost extension to the supply permanently. It is on this principle that London is supplied by five or six corporate associations. And it is thought to be more conducive to economy in practice, when personal attention is given to a concern in which we are interested."

Abernethy has well remarked that "Water is of such importance, not only as regards our drink, but also in preparing our food, that it may justly be said to be the vehicle of all our nourishment; so that whenever it possesses bad qualities, no wonder that on its passage through the body various diseases are engendered." How important, therefore, it is to obtain it pure, and until measures are adopted to afford a copious supply to the inhabitants of this city, we recommend the use of Mr. Parke's Filters, (see engravings,) by means of which rain water is rendered quite pure. They are for sale at No. 7 Wall street.

"The Patent Filter completely and effectually frees rain water collected from all deleterious earthy substances, and from all other impurities; thus rendering it pure and brilliant, and fit for drink and domestic purposes.

"Spring water has hitherto been used and preferred, but numerous medical authorities pronounce it injurious to health, as it usually holds in solution various earthy and metalic substances.

"The Patent Filter is highly requisite in every private family, hotel, and boarding house; as all kinds of food prepared in filtered rain water *is far more nutricious* than when prepared in spring water.

"The arrangement of the filtering part of this machine is such that they cannot get out of order for several years, if the instructions furnished by the patentee are attended to.

"The price of the Patent Filters are from eight to twenty dollars, and they will yield from *twelve to forty gallons of pure water* per day. The rapidity of the process being *six times greater* than that of the common filtering stone."

On the Atmosphere.—The atmosphere in which we live and breathe, its weight and pressure, and power, must excite in every reflecting mind a wish to be made acquainted with the causes of the phenomena of this ever agitated fluid. But little is known on the subject at present; all that is within our power is to collect and condense the few facts that are generally received as established, and lay them before our readers.—The subject is interesting to all, but to the lover of science especially so. It is useful to know that the constituents forming it are nitrogen and oxygen, with a small portion of carbonic acid gas, and many other curious facts, which will be found in this and the following pages:

Various conjectures have been formed with respect to the height of the atmosphere; and as we know to a certainty the relative weight of a column of the atmosphere by the height to which its pressure will raise water or mercury in an empty tube, so different calculations have been founded on these data, to ascertain its extent as well as its density at different heights. If the air of our atmosphere were indeed every where of a uniform density, the problem would be very easily solved. We should in that case have

nothing more to do than to find out the proportions between the height of a short pillar of air and small pillar of water of equal weight; and having compared the proportion which the height these bear to each other in the small, the same proportions would be certain to hold good in the great, between a pillar of water thirty-two feet high and a pillar of air that reaches to the top of the atmosphere, the height of which we wish to know. Thus, for instance, we find a certain weight of water reaches one inch, and a similar weight of air reaches seventy-two feet high: this, then, is the proportion two such pillars bear to each other on the small scale. Now, if one inch of water is equal to seventy-two feet of air, to how much air will thirty-two feet of water be equal; by the common rule of proportion, we readily find that thirty-two feet, or 384 inches, of water, will be equal to 331.776 inches, which makes something more than five miles, which would be the height of the atmosphere, was its density every where the same as at the earth, where seventy-two feet of air were equal to one inch of water. But this is not really the case; for the air's density is not every where the same, but decreases as the pressure upon it decreases; so that the air becomes lighter and lighter the higher we ascend; and at the upper part of the atmosphere, where the pressure is scarcely any thing at all, the air, dilating in proportion, must be expanded to a very great extent; and therefore the height of the atmosphere must be much greater than has appeared by the last calculation, in which its density was supposed to be every where as great as at the surface of the earth. In order, therefore, to determine the height of the atmosphere more exactly, geometricians have endeavored to determine the density of the air at different distances from the earth.

The following sketch will give an idea of the method which some have taken to determine this density, which is preparatory to finding out the weight of the atmosphere more exactly. If we suppose a pillar of air to reach from the top of the atmosphere down to the earth's surface, and imagine it marked like a standard by inches from the top to the bottom, and still further suppose that each inch of air, if not at all compressed, will weigh one grain, the topmost inch then weighs one grain, as it suffers no compression whatever; the second inch is pressed by the topmost with a weight of one grain, and this, added to its own natural weight or density of one grain, now makes its density, which is ever equal to the pressure, two grains. The third inch, by the weight of the two inches above it, whose weight united make three grains, and these added to its natural weight give it a density of four grains. The fourth inch is pressed by the united weight of the three above it, which together make seven grains, and this added to its natural weight gives it a density of eight grains. The fifth inch being pressed by all the former fifteen, and its own weight added, gives it a density of sixteen grains, and so on, descending downwards to the bottom. The first inch has a density of one, the second inch has a density of two, the third inch a density of four, the fourth of eight, the fifth of sixteen, and so on. Thus the inches of air increase in density as they descend from the top, at the rate of 1, 2, 4, 8, 16, 32, 64, &c. Or, if we reverse this, and begin at the bottom, we may say, that the density of each of these inches grows less upwards. If, instead of inches, we suppose the parts into which this pillar of air is divided to be extremely small, and like those of air, the rule will hold equally good in both, so that we may generally assert that the density of the air from the surface of the earth decreases in a geometrical proportion.

This being understood, should we now desire to know the density of the air at any certain height, we have only first to find out how much the density of the air is diminished to a certain standard height, and thence proceed to tell how much it will be diminished at the greatest height that can be imagined. At small heights the diminution of its density is by fractional or broken numbers. We will suppose at once that at the height of five miles the air is twice less dense that at the surface of the earth: at two leagues high it must be four times thinner and lighter, and at three leagues eight times thinner and less dense, and so on. In short, whatever decrease it received in the first step, it will continue to have in the same proportion in the second, third, and so on, and this, as was observed, is called geometrical progression.

In proof of the great diminution in the elasticity of the air as we ascend from the earth's surface, it may be enough to state that if the common balloon was filled on ascending from the earth, the gas would burst its "silken envelope" long ere it had attained the ordinary elevation of those flying vehicles. One of the modes of ascertaining by direct experiment the diminished density,

consists in filling a flask with air at a given altitude, and then closing the aperture till the experimentor arrives at the earth's surface. The aperture is afterwards opened under water, and the difference between the air above and below is indicated by the quantity of water which enters.

Dr. Cotes has also shown that if altitudes in the air be taken in arithmetical proportion, the rarity of the air will be in geometrical proportion. For instance,

At the altitude of … Miles above the surface of the earth, the air is	… times thinner and lighter than at the earth's surface.
7	4
14	16
21	64
28	256
35	1024
42	4096
49	16384
56	65536
63	262144
70	1048576
77	4194304
84	16777216
91	67108864
98	268435456
105	1073741824
112	4294967296
119	17179869184
126	68719476736
133	274877906944
140	1099511627776

And hence it is easy to prove by calculaion, that a cubic inch of such air as we breathe would be so much rarified at the altitude of 500 miles, that it would fill a sphere equal in diameter to the orbit of Saturn.

Upon the same principle it was attempted to calculate the height of the atmosphere, by carrying a barometer to the top of a high mountain, and the density of the air at two or three different stations was easily ascertained. But so feeble are human efforts in endeavoring to comprehend and measure the works of the Creator, that this theory was soon demolished. It was found that the barometrical observations by no means corresponded with the density, which, by other experiments, the air ought to have had; and it was therefore suspected that the upper parts of the atmosphere were not subject to the same laws or the same proportions as those which were nearer the surface of the earth. Another still more ingenious method was therefore devised. Astronomers know to the greatest exactness the part of the heavens in which the sun is at any one moment of time: they know, for instance, the moment at which it will set, and also the precise time at which it will rise. They soon, however, found that the light of the sun was visible before its body, and that the sun itself appeared some minutes sooner above the horizon than it ought to have done for their calculations. Twilight is seen long before the sun appears, and that at a time when it is several degrees lower than the horizon. There is then, in this case, something which deceives our sight; for we cannot suppose the sun to be so irregular in its motions as to vary every morning; for this would disturb the regularity of nature. Deception actually exists in the atmosphere; by looking through this dense transparent substance, every celestial object that lies beyond it is seemingly raised up in a similar way to the appearance of a piece of money in a basin filled with water. Hence it is plain, that if the atmosphere was away, the sun's light would not be brought to view so long in the morning before the sun itself actually appears. The sun itself, without the atmosphere, would appear one entire blaze of light the instant it rose, and leave us in total darkness the moment of its setting. The length of the twilight, therefore, is in proportion to the height of the atmosphere: or let us invert this, and say that the height of the atmosphere is in proportion to the length of the twilight: it is generally found, by this means, to be about forty-five miles high, so that it was hence concluded either that that was the actual limit of the atmosphere, or that it must be of an extreme rarity at that height.

Dr. Arnott, in his *Treatise on Physics*, gives a very beautiful and familiar view of the effects of atmospheric pressure in changing the temperature at various altitudes. The following is his explanation of the phenomenon: If a gallon of air at the surface of the earth contain a certain quantity of heat, this must be diffused equally through the space of the gallon; but if the air be then compressed into one tenth of the bulk, there will be ten times as much heat in that tenth as there was before; and the increase will affect the thermometer. In like manner, if by taking off pressure the gallon be made to dilate to ten gallons, the heat will be in the same proportion diffused, and any one part will be proportionably colder than before. It is known that air may be so much compressed under the piston of a close syringe, that the heat in it, similarly concentrated, becomes intense enough to inflame tinder attached to the bottom of the piston. This contrivance is in common use as a means of obtaining an instantaneous light, and is called the match syringe.

Now, for the reason here explained, the air near the surface of the earth, forming the bottom of the atmosphere, because con-

densed by the weight of the air above it, is much warmer than if it were suddenly carried higher up, where, from the pressure being less, it would be more expanded or thin. In many cases the height of mountains may be estimated by the difference of temperature observed at the bottom and at the top. While a thermometer stands at 60 degrees at the bottom of St. Paul's Cathedral, in London, another marks only 58 degrees at the top of the dome; and in the lofty ascent of a balloon, the thermometer soon falls to the freezing point, and below it, so that to the aeronaut the cold becomes almost insupportable.

In every part of the earth there is a certain elevation in the atmosphere, different according to the proximity to the equator, at which the thermometer never rises above the freezing point,—and this limit is called the level of perpetual congelation. In Norway, it is at five thousand feet above the level of the sea; in Switzerland, at six thousand five hundred; in Spain and Italy, at seven thousand; farther south, at Teneriffe, at nine thousand; directly under the sun, as in Central Africa, and among the Andes, in America, it is about fourteen thousand.

It appears, therefore, that the same low temperature may be met with at the equator as at the poles, by rising to find it; and we see why the snow-capt mountains are not the tenants only of high northern and southern latitudes. It is this truth which renders many parts of the tropical regions of the earth not only tolerable abodes, but as suitable as any on earth, although the ancient philosophers of Europe thought them, by reason of the great heat, uninhabitable by man, and an everlasting barrier between the northern and southern hemispheres. Much of the central land of America near the tropics is so raised, that as to agreeable temperature it rivals an European climate, while the lightness and purity of air, and the brightness of the sun, add delightfully to its charms.

The vast expanse of table-land forming the empire of Mexico is of this kind, enjoying the immediate proximity of the sun, and yet, by its elevation of seven thousand feet above the level of the ocean, possessing the most healthful freshness. The land in many parts has the fertility of a cultivated garden, and can produce naturally most of the treasures of vegetation found scattered over the diversified face of the earth. Mexico, well governed, might become a realization of Paradise. The plains of Colombia, in South America, and indeed all along the ridge of the Andes, are similarly circumstanced. What a singular contrast it is, after sailing one thousand miles up the level river Magdalena, in a heat scarcely equalled on the plains of India, all at once to climb from the low region to the table-land above, where Santa Fe de Bogota, the capital of the republic, is seen smiling over interminable plains, that bear the livery of the fairest fields of Europe.

Persons, not reflecting on the law which we are now illustrating, have expressed surprise that wind or air blowing down upon them from a snow-clad mountain should still be warm and temperate. The truth is, that there is just as much heat combined with an ounce of air on the mountain top as in the valley; but above, the heat is diffused through a space perhaps twice as great as when below, and therefore is less sensible. It may be the same air which sweeps over a warm plain at the side of a mountain, which then rises and freezes water on the summit, and which in an hour after, or less, is again found among the flowers of another valley, as a gentle and warm breeze.

As the temperature in different parts of the atmosphere depends thus upon the rarity of the air, and therefore upon the height, the vegetable productions of each distinct region or elevation have a distinct character; while many other peculiarities of places and climate depend on the rarity of the air.

The animal body is made up of solids and fluids, and the atmospheric pressure affects it accordingly. One has difficulty at first in believing that a man's body should be bearing a pressure of fifteen pounds on every square inch of its surface, while he remains altogether insensible to the influence; but such is the fact. Reflection discovers that his not feeling the fluid pressure is owing to its being perfectly uniform all around. If a pressure of the same kind be even many times greater, such, for instance, as fishes bear in deep water, or as a man supports in the diving bell, it must equally pass unnoticed. Fishes are at their ease in a depth of water where the pressure around will instantly break or burst inwards almost the strongest empty vessel that can be sent down; and men walk on earth without discovering a heavy atmosphere about them, which, however, will instantly crush together the sides of a thick iron boiler, left for a moment without the counteracting internal support of steam or air.

The fluid pressure on animal bodies, thus unperceived under ordinary circumstances, may be rendered instantly sensible by a lit

tle artificial arrangement. In water, for instance, an open tube partially immersed becomes full to the level of the water around it, and the water contained in it is supported by what is immediately below its mouth: now, a flat fish resting closely against the mouth of the tube would evidently be bearing on its back the whole of this weight—perhaps 100 pounds; but the fish would not thereby be pushed away, nor would it even feel its burden, because the upward pressure of the water immediately under it would just counterbalance, while the lateral pressure around would prevent any crushing effect of the mere upward and downward forces. But if, while the fish continued in the supposed situation, the 100 pounds of water were lifted from off its back by a piston in the tube, the opposite upward pressure of 100 pounds would at once crush its body into the tube and destroy it. At a less depth, or with a smaller tube, the effect might not be fatal, but there would be a bulging or swelling of the substance of the fish into the mouth of the tube. In air, and in the human body, a perfectly analogous case is exhibited. A man without pain or peculiar sensation lays his hand closely on the mouth of a vessel containing air, but the instant that the air is withdrawn from within the vessel, the then unresisted pressure of the air on the outside fixes the hand upon the vessel's mouth, causes the flesh to swell or bulge into it, and makes the blood ooze from any crack or puncture in the skin.

These last few lines closely describe the surgical operation of cupping; the essential circumstances of which are the application of a cup or glass, with a smooth blunt lip, to the skin of any part, and the extraction by a syringe or other means of a portion of the air from within the cup. It may facilitate to some minds the exact comprehension of this phenomenon, to consider the similar case of a small bladder or bag of India rubber, full of any fluid, and pressed between the hands on every part of its surface except one, at which part it swells, and even bursts, if the pressure be strong enough. So in cupping medicinally, the whole body, except the surface under the cup, is squeezed with a force of fifteen pounds on the square inch, while in that one situation the pressure is diminished according to the degree of exhaustion in the cup, and the blood consequently accumulates there. The mere application of a cup with exhaustion constitutes the operation called dry cupping; to obtain blood, the cup is removed, and the affected part is cut into by the simultaneous stroke of a number of lancet points. The cup is afterwards applied as before, so that the blood may rush forth under the diminished pressure. The partial vacuum in the cup may be produced either by the action of a syringe, or by burning a little spirit in the cup, and applying it while the momentary dilatation effected by the heat has driven out the greater part of the air. The human mouth applied upon a part becomes a small cupping machine, and formerly, in cases of poisoned wounds, was used as such. It may be proper to add, that the late discoveries of Dr. Barry have shown that the timely application of a cupping-glass prevents the spread of contagion, either in cases of poison or hydrophobia.

If a flat piece of moist leather be put in close contact with a heavy body, as a stone, it will be found to adhere to it with considerable force; and if a cord of sufficient length be attached to the centre of the leather, the stone may be raised by the cord. This effect arises from the exclusion of the air between the leather and the stone. The weight of the atmosphere presses their surfaces together with a force amounting to 15 pounds on every square inch of those surfaces in contact. If the weight of the stone be less than the number of pounds which would be expressed by multiplying the number of square inches in the surfaces of contact by 15, then the stone may be raised by the leather; but if the stone exceed this weight, it will not suffer itself to be elevated by these means.

The power of flies and other insects to walk on ceilings and surfaces presented downwards, or upon smooth panes of glass in an upright position, is said to depend on the formation of their feet. This is such, that they act in the manner above described, respecting the leather attached to a stone; the feet, in fact, act as suckers, excluding the air between them and the surface with which they are in contact, and the atmospheric pressure keeps the animal in its position. In the same manner the hydrostatic pressure attaches fishes to rocks; and that "giant of the deep," the walrus, supports itself by a sort of air-pump apparatus in its feet.

Sewing on Glazed Calico.—By passing a cake of white soap a few times over a piece of glazed calico, or any other stiffened

material, the needle will penetrate with equal facility as it will through any kind of work. The patronesses of the School of Industry pronounce this to be a fact worth knowing, the destruction of needles in the ordinary way occasioning both loss of time and expense.—[Taunton Courier.]

On Comets.—It is a generally received notion among a great number of persons, that the near approach of a comet would break our planet in pieces, or at least produce a great accession of heat, sufficient perhaps to destroy animal and vegetable life, if not to burn the world altogether. The argument seems to have originated in a notion, that because heat produces expansion, therefore very highly expanded bodies must needs be very hot. It would be as good an argument to say, that because expansion by any other means except heat produces cold, that therefore all comets must be very cold; and neither argument would, in the least degree, afford matter even for a rational conjecture. We can form so little idea of what the state of a planet of vapor, it may be consisting only of one sort of matter, would be, that we might with as much reason speculate upon the possible organization of the possible animalculæ which swim in that vapor, as try in the present state of our knowledge to ascertain whether any and what degree of danger awaits us from such a source. A comet *may* certainly strike the earth in the next century; not one of these which are known, unless the laws of nature be singularly altered, but some one or other yet to come. It has been shown, but by considerations of so high a nature that the result cannot be expected to bring much conviction to any but a mathematician, that if a comet were launched at hazard into our system, for one orbit in which it could strike the earth there are 281 millions in which no such thing could take place as the laws of nature stand at present. The *advocates* of cometary interference (we have met with some whose manner of expressing their opinion on the subject almost entitles them to that name) usually suppose a special interposition of the Divine power, which resting on their own interpretations of certain scriptural prophecies,) they suppose will bring a comet on the earth. They are usually people of some religious feeling, and would act more consistently with the idea they ought to have of their own ignorance and the Divine power, if they ceased to prescribe to the Creator in what way it should please him to alter the course of events which it has hitherto been his will to arrange. It is impossible to produce any other argument on the subject, consistently with the design of this paper; the province of natural philosophy is to collect and compare facts, and to say what *will* be, if things continue as they *have* been; it never presumes even to conjecture what shall be, when the power which has hitherto disposed events in one manner shall judge it right to ordain a different arrangement.

As to the multitude of idle theories with which, for want of better information, this part of astronomy has been loaded, such as that the planetary system was formed by matter struck off from the sun by one comet; that another caused the deluge; that the four small planets were formerly one, which was broken in pieces by a third; that the moon was originally a comet, and the like: we would willingly amuse our readers by an account of them, if our limits permitted. They will however find them all handsomely exposed by M. Arago, in the *Annuaire* of the French Board of Longitude, for 1832. If any or all them should be hereafter proved to be true, it will be no excuse for those who first made them; for a result produced on insufficient evidence is bad, whether true or false. As the science of astronomy approaches towards perfection, we shall doubtless add some important and interesting facts to our knowledge of comets.

Hydro-Oxygen Microscope.—A considerable number of scientific persons attended to witness the first public display of the powers of this extraordinary optical instrument, which may be considered an improvement on the solar microscope. The great defect of the latter is that its effectiveness depends wholly upon the unclouded presence of the sun. Its operations, the result of refraction, are suspended whenever it is deprived of the full potency of the solar beams. In our climate, therefore, but especially in winter, it can be resorted to but seldom, and never with perfect satisfaction. To obviate this inconvenience, the aid of oxygen and hydrogen gas has been resorted to, and their united stream being directed against a piece of lime, produces a light of such vivid force as effectually answers all the purposes of strong solar illumination. We need not refer to the wonderful magnifying power of the solar microscope. Most of our readers must ere this be familiar with it. Suffice it to say

that it can in truth represent objects five hundred thousand times larger in size than they really are. Thus the pores of the slenderest twig, and the fibres of the most delicate leaf, expand into coarse net work. The external integuments of a fly's eyes, filled with thousands of lenses, appear in the dimensions of a lady's veil; that gentleman 'yclept the flea swells into six feet; worms seem like boa constrictors; while the population of a drop of goodly ditch water presents such shapes as Teniers should have seen before he pencilled the grotesque monsters who troubled the solitude of Saint Anthony. The hydro-oxygen microscope, we need scarcely add, promises to do much more for mankind than to gratify its curiosity. It will prove an important assistant in the investigation of physical science.—[Bell's Weekly Messenger.]

Improved Rotary Steam Engine. By Philo. To the Editor of the American Mechanics' Magazine.

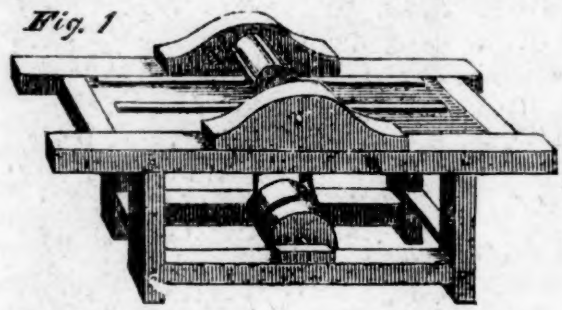
Lancaster, Pa. May 14, 1833.

Sir,—The "Improved Rotary Steam Engine," of which drawings and a description are given in the third number of the American Mechanics' Magazine, is not the invention of "Mr. Mollery, of Oswego," to whom it is credited in that Journal, but of Phineas Davis, of York, in this state. An engine precisely similar in principle, and differing very little in construction, was made by Mr. Davis, and used as the moving power of the Steam Clover Mill, which was burnt in the borough of York thirteen or fourteen years ago. The inventor, in connection with other gentlemen, was subsequently engaged in constructing an engine on the same principle and plan, at the foundry of Rush and Muhlenburg, in Philadelphia. That engine was intended to be applied to propelling a boat in the Delaware; the enterprise however failed—from some cause which is not distinctly remembered. There are many persons at York who would, from the drawings of Mr. Mollery's engine, at once recognise the identity of the machines. Two of Mr. M.'s engines, "of such dimensions that a man might easily carry one in each hand," are stated to propel a small vessel "of the size of a common canal boat," at the rate of "ten miles an hour," one engine being applied to each wheel. We will not question the correctness of this statement, but do not perceive, from the drawings or description, any such variation, in the construction adopted by the New-Yorker, as seems sufficient to account for a more successful application, by him, of the principle to steamboat navigation, than was accomplished by the original inventor. I am, sir, yours, &c.

Philo.

Description of Tichenor's Patent Machinery for making Window Sash, Pannel Doors, Window Blinds, and Pannel Work generally. Communicated by the Proprietors, for the American Mechanics' Magazine.

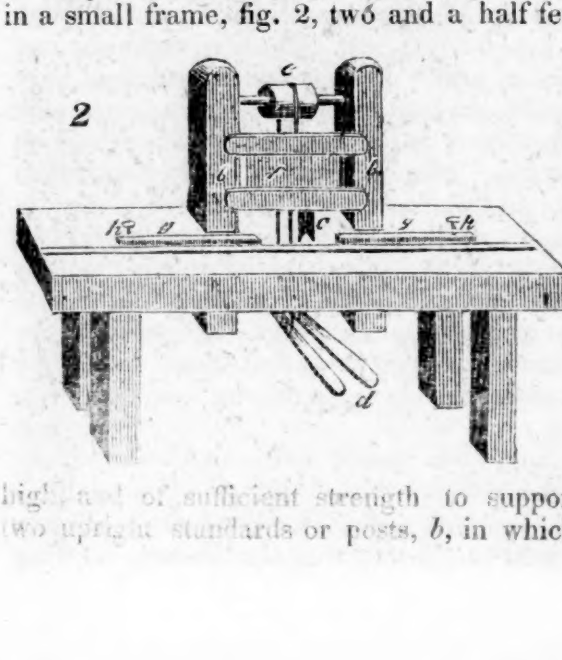
Fig. 1



For making window sash, &c. the plank is sawed up into proper lengths and widths by the use of circular saws, which are set on proper frames, for that purpose, the operation and construction of which are too generally known to need description.

The planing is done on a wooden frame, fig. 1, made of timbers four by five inches square, six feet long, two feet wide, and three feet high; on the top of this frame, which is a smooth surface, made so by plank laid level with the top of the plates, stands a circular cylinder, X, with cast steel knives or cutters, under which the stuff is passed to be planed while the cutters are in rapid motion. This cylinder may be raised or lowered at pleasure, to cut the thickness of the stuff to be planed. The small morticing is done in a small frame, fig. 2, two and a half feet

2



high, and of sufficient strength to support two upright standards or posts, *b*, in which

grooves are made for a slide to move; in the slide are two chisels, *c*, set for making the small mortice after boring. This is done by two treadles or levers, *d*, which are moved by the foot, one to press it down, and the other to raise it up, by means of a cord, *e*, passing over a pulley, which is attached to the slide, *f*, containing the chisels. The stuff to be morticed is kept in its place by the gages, *g g*, which are fastened by screws, *h h*.

3

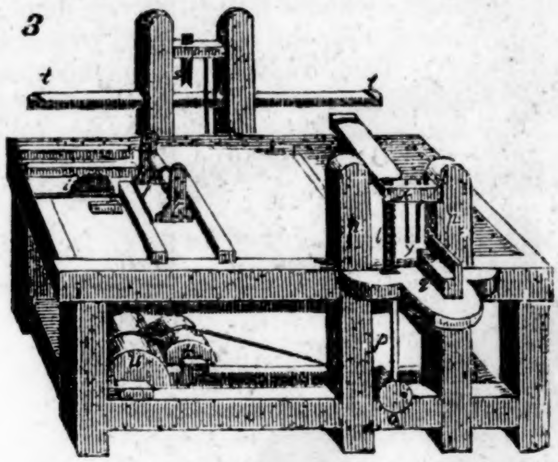


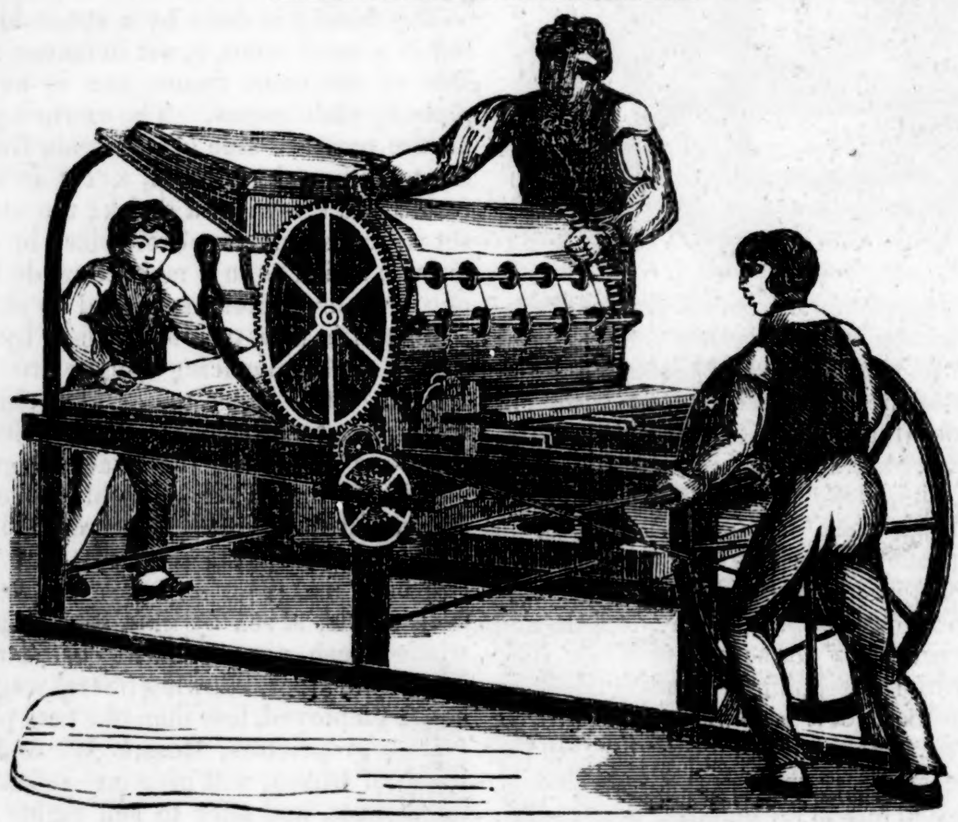
Fig. 3 represents a wooden frame of timber four inches by five inches square, eight feet long, six feet wide, and three feet high, to the top of the plates, with girts a sufficient height from the bottom to hang the drum-cranks, &c. on the frame. The following kind of work is done: the stuff, being planed, is taken to a small circular saw, *i*, set in motion on one end of the frame, and cut to an exact length by the aid of a wood slide gage, which can be set to any length, and can be screwed by set screws or keys. The next operation is tenoning: a small frame or gate, *k*, similar to a common saw gate, is fixed on the side of the large frame: in the top of the small frame are set two chisels, *y*, of sufficient length for tenoning small stuff; there are two saws, *l*, hung in the same gate or frame, for tenoning larger stuff for doors, &c. one of which can be used for dove-tailing, with proper gages. In the same gate or frame is hung an instrument, called a coper, *m*, which is constructed of a flat piece of steel, secured on just far enough forward to serve as a gage for cutting the coping sufficient deep to form a correct fit to the moulding of the sash. The gate, or small frame, is hung within two perpendicular posts, *n n*, screwed on the side of the main frame, on which posts are fastened two bars of round iron, polished, and fitted for the gate to slide on; immediately under this gate, and on the lower girts of the main frame, hangs an eccentric wheel, *o*, to which a pitman, *p*, is attached, which connects with the gate or frame in which the saws, chisels and coper, hang, and when put in quick motion by a strap or gearing is a very expeditious mode of making tenons, &c. This is done by passing the stuff along by the wooden gage, *q*, under the chisels, *y*, or up to the saws, *l*, as fast as they cut clear; a screw gage is fixed to regulate the length of the tenons; when large tenons are made by the saws, the shoulders are cut by a small circular saw, *i*, hung for that purpose at one end of the main frame, over which the stuff is passed by a wooden gage, so as to gage it just deep enough, and moveable at pleasure.

The boring is done by a spoon-bill bit fitted in a small arbor, *r*, set in motion at either side of the main frame, and is kept in its place by slide gages. The morticing is done on the opposite side of the main frame from the tenoning, by chisels, *s*, set in a similar frame and driven by a crank; the chisels are set transversely or crosswise, in order to leave a relish as in a mortice made by hand; one or more holes are bored to start from. The stuff is kept true to its place by slides or gages. The morticing is completed by passing the stuff along under the chisels, the same as in tenoning; a gage, *t*, is hung out at each end to govern the exact length of the mortice. One of these machines has been in successful operation for upwards of six months at Ithaca, Tompkins county. One man and two boys make, on an average, twelve hundred lights, seven by nine and eight by ten window sash, per week with ease, making the cost of the labor, allowing liberal wages to the hands employed, less than one cent per light.

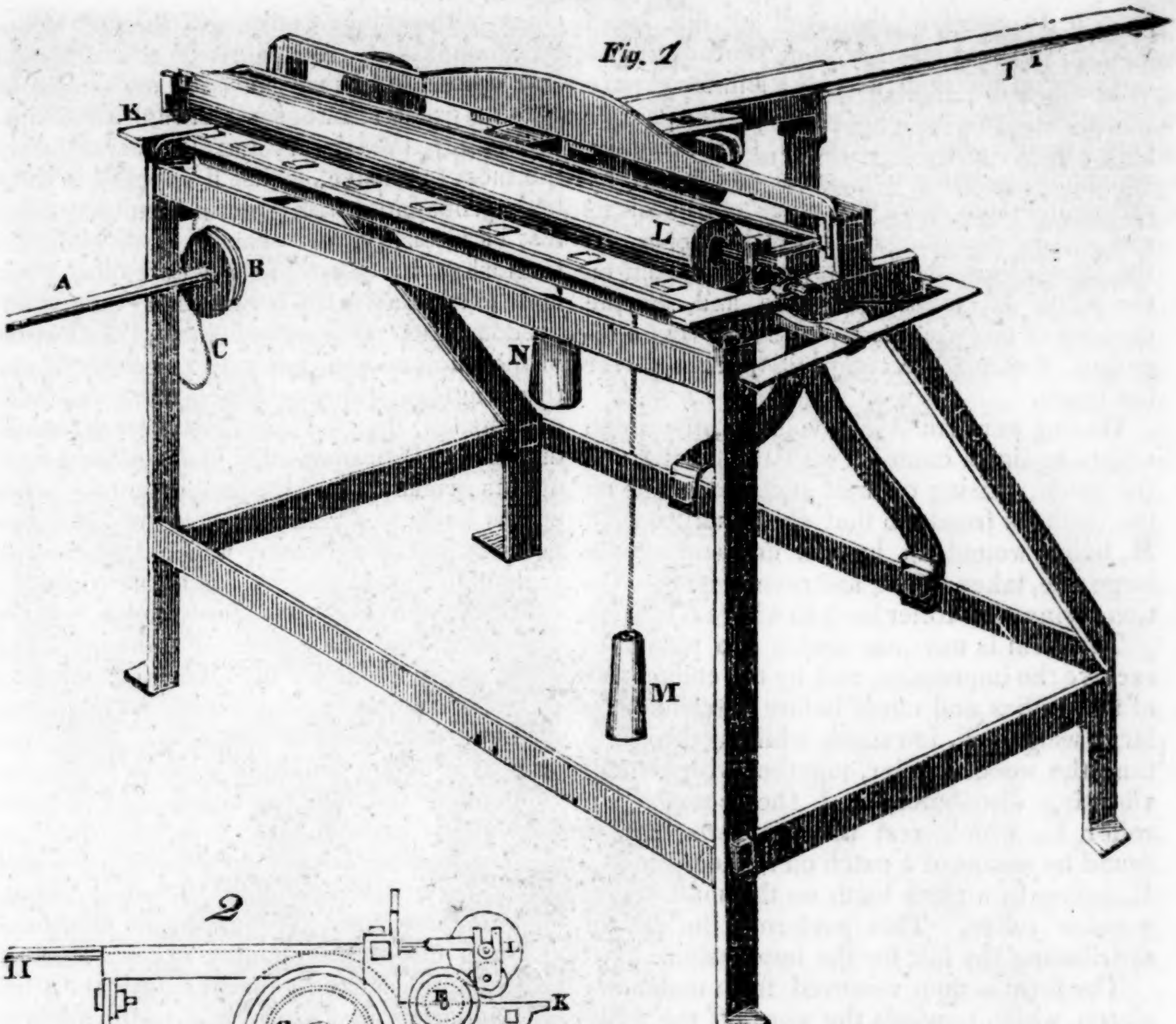
The proprietors, Messrs. W. & J. Woodward, of Ithaca, will give any information on the subject, and offer to sell rights for large or small districts of country. These machines are about to be erected in the following counties: Courtlandt, Tioga, Steuben, Cayuga, Oneida, Jefferson, Genesee, and Orleans.

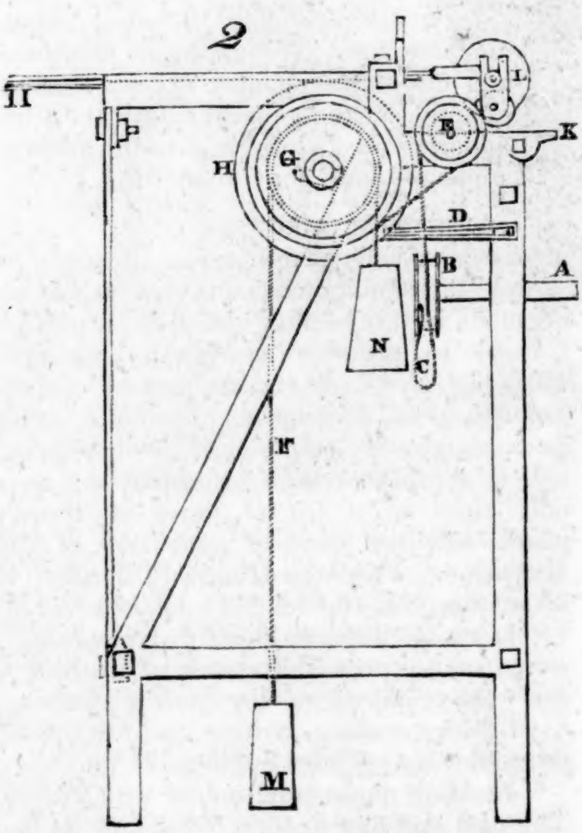
Sub-marine Boat.—In the course of last autumn, M. Villeroi, of Nantes, made a successful experiment at sea, off the island of Noirmoutier, with a locomotive sub-marine boat of an entirely novel construction. It is ten feet six inches in length, and three feet seven inches diameter in its greatest width. The machinery by which it is impelled is said to be a mechanical application of the forms and means with which nature has en-

dowed fish, and, in this instance, it is brought into play by the aid of steam. When the flux of the sea had attained its height, the inventor stepped into his boat, navigated for half an hour on the surface of the water, and then disappeared at a spot where the depth was between fifteen and eighteen feet, bringing up with him, on his re-appearance, a quantity of flints and a few shells. During his submersion he steered his boat in various directions, in order to deceive those who thought that they were following in his track, and rose at some distance from any of them. He then shifted his course repeatedly whilst navigating the surface; and at the termination of an hour and a quarter's practice, he threw off the cover which had protected and concealed him, and showed himself to the spectators amidst hearty cheers. It is obvious, from the success which attended this essay, that with the aid of M. Villeroi's ingenious machine, an individual may traverse a considerable distance under water with the same velocity as a common boat, and after calculating the depth to which he should plunge according to the density of the water, post himself under a ship's side for a hostile or other purpose, cut their cables asunder without being liable to detection, or descend for the recovery of wrecked stores, &c. The inventor was accompanied by two assistants, neither of whom suffered any inconvenience during their hour's submersion. The boat is constructed of iron.



Rutt's Printing Machine, made by Napier, (*Hoe's Improvement.*)—This machine is put in motion by hand labor; the engraving represents the carriage at the back part of the machine, with the form of type just after a sheet has been printed, and the lad at the back in the act of taking it away: the table or carriage then returns to the front of the machine, to receive the ink for the next impression, which is communicated from the ink receiver by several rollers, distributing the ink one from the ot er until it finally reaches the form upon the carriage by means of an elastic composition roller; in the mean time, another sheet is brought from the heap, sufficiently over the edge of the board (and not *on* the cylinder, as shown in the above cut,) to enable a range of grippers, that are fastened with springs upon the cylinder, to seize and convey it on the form as the carriage again passes under, when it receives the impression; and it is then delivered at the back of the machine as above. The carriage and cylinder are propelled by cogged wheels, as will be seen on reference to the cut—the former having a fly-wheel attached beneath it; and the inking apparatus is kept in motion by a cogged rail fastened on the carriage.





Patent Improved Ink Distributor.—We have been much pleased with inspecting and witnessing the operation of Messrs. Sabbaton & Spence's Patent Ink Distributor, in book printing, at the office of Mr. Dean, Frankfort street, in this city.

This machine, represented by the annexed plates, stands at the opposite side of the press to the workman, and receives its impulse from the rotary motion of the rounce, the shaft, A, of which is made long, passing to the end of the machine, where the pully, B, is fast; through the rim of this pully the end of the chord, C, is tied, and the other end, passing between a projection of iron, D, and a spring, is fastened to the loose pully, E, on the shaft of a wooden roller, as represented in figs. 1 and 2. This pully is attached by the same cord to pully G, on the end of the main shaft, that supports the pullies and weights in the centre of the frame, where a large loose pully, H, is connected by two catgut cords, II, passing in opposite directions to each end of the tail of the frame, K, that supports the composition roller, L.

On the side of the loose pully, H, is a

groove to receive the cord of the small weight, M; and on the other side a pully is fastened on the shaft, having a similar groove for the large weight, N, and on its periphery a catch tooth is held by a latch, to prevent the weight from falling until required; when, by raising the tympan, a flat piece of iron on its end presses a tripping rod inward, which raises the latch clear of the tooth, when a catch on the pully, H, takes its place, and, by the descent of the weight, N, both go round together, forcing the composition roller over the types.

Having performed a revolution, the tooth comes again in contact with the latch, and the catch, raising over an inclined plane on the latch, is freed, so that the small weight, M, being wound up by the descent of the large one, takes effect, and reversing the motion, brings the roller back to where it started.

The form is now run under the platen to receive the impression, and, by the connection of the pullies and cords before described, the large weight, N, is raised, while at the same time the wooden roller, together with a small vibrating distributor, and the composition roller, L, which rest upon it, are carried round by means of a catch on the loose pully, E, acting in a ratch tooth on the shaft of the wooden roller. This performs the act of distributing the ink for the impression.

The form is then removed from under the platen, which unwinds the cord off the pully on the rounce; but the projection, D, and spring, prevent it from throwing off the loose pully, E. The tympan being raised, the large weight performs the same operation as before described, winding up the slack cord on the loose pully, E, by means of the connection of the cord F, with the pully G, on the end of the main shaft; and by a snail on the same shaft, the small vibrating distributor is pressed down to a metal roller in the ink fountain, where the ink being regulated by a straight edge in four parts, and moved by eight screws, it receives the necessary supply.

The metal roller is turned round in the fountain by a catch on the frame of the small distributor, acting in a ratch wheel on its end.

Thus, by a simple compact piece of mechanism, the whole operation of distributing the ink for letter-press printing is well and accurately performed, with scarcely any additional labor to the workman.

Geological Course of Cholera.—Mr. Boubee has made some researches into the geology of the countries through which the Cholera has passed, from which he remarks that this epidemic has spread most speedily, and with its greatest intensity, through those dis-tircts where the tertiary and alluvial earths are the most extensive, whilst it appears to have been propagated with great difficulty, to have lost its intensity, and even to have been extinguished in those parts where the older and particularly the primordial formations predominate. This coincidence of the course of the cholera with particular geological districts agrees with the observation pretty well established, that the circumstance of humidity and evaporation favor the developement of this disease. In fact, tertiary and alluvial earths have, to a remarkable degree, the property of imbibing water, which being again yielded by a prolonged evaporation, produces a humidity of the atmosphere entirely dependent on the nature of the soil. The older formations, on the contrary, compose ordinary compact rocks, which, being impermeable, can neither absorb moisture nor present it to the atmosphere by evaporation. Sometimes the old formations and volcanic depositions present rocks that are friable or decomposed in particular places, in which cases they will resemble the more recent ones in absorbing and affording moisture, and this circumstance may explain some of the exceptions to the general rule of the Cholera adhering in its progress to the modern formations.—[Jour. du Chimie Med.]

General Education.—It is pleasing to witness the simultaneous efforts that are being made in this country and in most parts of Europe to promote universal education. Here our Lyceums and institutions, for the promotion of science and literature, of all descriptions, are almost daily increasing, and as a proof of their prosperity we need only refer to a list of those at Boston, which will be found at page 250 of this Magazine. From the Quarterly Journal of Education, No. 10,* recently published by the "Society for diffusing Useful Knowledge," we extract a proposed course of instruction for "the children of the poorer classes:"

"Besides reading, writing, and arithmetic, the following subjects ought to be taught:

"*Reading* ought to be united with *history*. The best and first history, of course, is that of the pupil's native country, which should be written, we need hardly say, very differ-

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* London, C. Knight, Pall Mall East.

ently from any book of the class yet published. A school library, stored with useful books, might afford inestimable advantages. And why should England see her labors for promoting knowledge and enlightening mankind turned to a better account in other countries than in her own?

"To *writing*, i. e. calligraphy and orthography, should be added lessons on the *general principles* and nature of *language*.

"*Elementary drawing*, which has been so often recommended, should certainly be a part of the education of all classes. It might be confined to the slate, and consist in teaching to draw straight and curved lines, with regular figures, accompanied by drawings composed of these lines and figures; and, finally, the pupil should draw various real objects. This branch of drawing proceeded from, and is cultivated in, Pestalozzian schools.

"The copying of pattern drawings and objects of nature must be chiefly left to the taste and opportunities of every individual pupil. The symmetrical figures, or compositions expressing merely symmetry, such as architectural ornaments, patterns of vessels, furniture, &c. need only be drawn on slates during the lesson, and may afterwards be copied at home into books with lead pencil, by those who show any taste and wish for it; and their books might occasionally be brought to school for the inspection of the master. There is little doubt that those who, after leaving school, enter trades, may derive the greatest advantages from those lessons of drawing, which develope and cultivate a taste for beauty and symmetry of form. Such practice would, undoubtedly, soon have a beneficial effect on all great branches of our national industry, where the taste of the workman is called into action.

"*Geography*, at least of their own country, and in the upper classes a general description of the globe, ought to be taught in all schools, with the aid of maps, &c., accompanied in each case with an account of the natural and manufactured products which characterise each country.

"*Arithmetic* is indispensable; and some elements of

"*Geometry* might be given in the drawing lesson.

"*Music* also should be taught. The objection that this is impracticable, because English boys, generally speaking, possess no ear for music, is quite groundless; for experience, in a sufficient number of instances to warrant a general rule, has proved the contrary to be the case. English boys are naturally quite as musical as German and French boys, and in Germany singing is taught in every school. Music was generally cultivated in England at one time, and it will again become general, and increase content and happiness, when the condition of the poorer classes will allow them a little more comfort and rational enjoyment than they now possess.

"*Religious* and *moral instruction* need not be particularly specified here; it is that on which the success of all other instruction chiefly depends.

"By what means the general instruction of the lower classes can be effected to the extent here briefly pointed out, is a question which belongs to the government to answer, and we hope they will soon speak out. This much may be said, that in the immense resources, and in the liberality and charitable character, of the English nation, there will be found sufficient means for establishing a school in every village throughout England and Wales, conducted on a plan similar to those in Germany, and particularly in Prussia. Parents ought to pay a trifle to prevent their undervaluing that which they can have for nothing. Boys ought to be compelled to attend these schools regularly, at least to their fourteenth, girls to their thirteenth year. No one who knows the English character will doubt that, if these village schools once obtained general esteem, there would be no want of exhibitions and prizes, &c. to enable the boy who showed distinguished abilities, and a good character, to go to a grammar school, and if he conducted himself well, to obtain any honor and advantages which education can confer."

The Society who put forth these sentiments contains among its committee many of the members of the British Cabinet, (including Lord Brougham as chairman,) and knowing, as every one must, the great zeal he displays in promoting General Education, we look with hope and confidence for some legislative enactment from the government, that shall place all the advantages here described within the reach of the most humble of the inhabitants of that country. The liberal principles they advocate will deter them from proposing any thing like compulsory measures, although we find an instance where such a plan has been and still is adopted; in the ninth number of the same Journal, the editor, alluding to the state of education at Saxe-Weimar, says, "By a statute of the Grand

Duchy, every head of a family is *compelled* either to send his children to school, or else to prove that they receive adequate instruction under his own roof. Heavy penalties are attached to any breach of this statute, which is as old as the very infancy of Protestantism. In fact, it was designed as one of its safeguards; and even at the present day, it may be defended on the score of sound policy: for what means can be pointed out which are more admirably adapted to promote social order and individual happiness than universal education, in harmony with rational Christianity? The immediate effect of the statute in question is to establish a schoolmaster in every village and hamlet throughout the country. There is not so much as a secluded corner, with a dozen houses in it, without its schoolmaster. None, therefore, can urge the want of opportunity in excuse of the breach of the law; and unless the parent can adduce the proof which exempts him, he is bound to send his children to school after they have attained to their sixth year. Nay, more: in order that the enactment may not be evaded, the commissioner of each district makes a regular periodical report, to the municipal authorities, of the children in his district who have reached what may be termed their 'scholastic majority.' Even in the smallest villages, every child pays twelve groschen (about 1*s.* 6*d.*) a year to the master of the school. Though the amount is inconsiderable, it partakes of the nature of a tax on every head of a family, and it is obligatory upon him to pay it, unless his circumstances are extremely limited; in this case the district is bound to advance it. The master of the school makes out a list of the children in arrear of their fees every quarter, and transmits it to the Grand-ducal Government, by whom the amount is immediately advanced. The *minimum* of allowance to the master of a country school is $100 (15*l.*) a year, independently of lodging and firing; and that to the master of a town school is from 125 to 150 (19*l.* to 23*l.*), according to the size of the town. So soon as this *minimum* is exceeded, the instruction becomes gratuitous, and the district is no longer bound to pay up the quota for indigent children. There are, however, certain districts which are too poor to make any advances of that nature, and, in their case, recourse is had to the district church, which is in general possessed of monies, arising from ancient Catholic endowments, and is, therefore, expected to assist the district where the education of its inhabitants requires such aid. Again, where this resource does not exist, there is a public fund, called "*Landschulen Fond*" (fund for country schools,) which assists the church, district, or families of the district, in completing the *minimum* of the master's allowance. This fund arises from voluntary donations, legacies, and the produce of certain dues which the state assigns to it, such as for dispensations in matters of divorce, or marriages between relatives, &c. This is the only portion of the expense which the state itself is called upon to contribute, and it is of very inconsiderable amount, though there are as many schools as villages in the Grand Duchy, and every master has a competent remuneration, as well as a claim to one half of his allowances in the season of old age or infirmity. Besides this there is a fund for the assistance of his widow and children, which has been raised out of his own statutory contributions of 2*s.* 3*d.* per quarter, and those of his colleagues; to which are added $350 a year from the State and Landschulen Fond; and certain dues laid aside for it by the Superior Consistory. All the national schools are under the superintendence of the local clergy, and the whole system is subject to the immediate control and direction of the Superior Consistory."

Such a system we should be sorry indeed to see allowed in any country; it is true the state as a state is not called upon to contribute greatly to its funds, but the Clergy and Consistory Court are clothed with too much power to suit our Republican notions.

Feats of M. Chaubert explained.—The feats sometimes performed by quacks and mountebanks, in exposing their bodies to fierce temperatures, may be easily explained on the principle here laid down. When a man goes into an oven raised to a very high temperature, he takes care to have under his feet a thick mat of straw, wool, or other non-conducting substance, upon which he may stand with impunity at the proposed temperature. His body is surrounded with air, raised, it is true, to a high temperature; but the extreme tenuity of this fluid causes all that portion of it in contact with the body, at any given time, to produce but a slight effect in communicating heat. The exhibitor always takes care to be out of contact with any good conducting substance; and when he exhibits the effect produced by the

oven in which he is enclosed upon other objects, he takes equal care to place *them* in a condition very different from that in which he himself is placed; he exposes them to the effect of metal or other good conductors. Meat has been exhibited, dressed in the apartment with the exhibitor; a metal surface is in such a case provided, and, probably, heated to a much higher temperature than the atmosphere which surrounds the exhibitor.

On Instinct.—In supplying the place of reason, instinct is perpetually assuming its semblance. Let us take an example or two from both the animal and the vegetable world.

In order that the seeds of plants should produce and perfect their respective kinds, it is necessary that their shoots rise to the surface of the earth to enjoy the benefit of light and air. Now, in whatever direction the eye of a seed, from which germination first radiates, is placed, these shoots ascend equally to the surface, either in curved or straight lines, according as such ascent may be most easily accomplished. Mr. John Hunter sowed a quantity of peas and beans with their eyes placed in different directions, in a tub, which he afterwards inverted, so that the bottom was turned uppermost, while the mould was prevented from falling out by a fine net. And in order that the under surface might possess a superior stimulus of light and heat to the upper, he placed looking-glasses around the mouth of the tub in such a way that a much stronger light was reflected upon the inverted mould than that of the direct rays of the sun; while, at the same time, he covered the bottom of the tub with straw and mats, to prevent the mould, in this direction, from being affected by solar influence. Yet the same instinctive law of ascent still prevailed. After waiting a considerable length of time, and perceiving that no shoots had protruded through the lower surface of the mould, he examined the contents of the tub, and found that they had all equally pressed upwards, and were making their way through the long column of mould above them, towards the reversed bottom of the vessel; and that where the eyes had been placed downwards, the young shoots had turned round so as to take the same direction. As one experiment leads on to another, he determined to try the effect of placing other seeds of the same kind in a tub, to which a rotatory motion should be given, so that every part of it might be equally and alternately uppermost, and the seeds should have no advantage in one direction over another. Here, as we often behold in other cases, the instinctive principle of accommodation was baffled by a superior power, and the different shoots, instead of ever turning round, uniformly adhered to a straight line, except where they met with a pebble, or any other resistance, when they made a curve to avoid such obstruction, and then resumed a straight line in the direction into which they were thereby thrown, without ever endeavoring to return to the original path.

"When a tree, which requires much moisture, (says Mr. Knight,) has sprung up or been planted in a dry soil, in the vicinity of water, it has been observed that much the larger portion of its roots has been directed towards the water; and when a tree of a different species, and which requires a dry soil, has been placed in a similar situation, it has appeared, in the direction given to its roots, to have avoided the water and moist soil."

"When a tree (remarks Dr. Smith) happens to grow from seed on a wall (and he particularly alludes to an ash in which the fact actually occurred,) it has been observed, on arriving at a certain size, to stop for a while and send down a root to the ground. As soon as this root was established in the soil, the tree continued increasing to a large magnitude."

The best means, perhaps, that a plant can possess of resisting the effect of drought, is a tuberous or a bulbous root. The grass called phleum *pratense*, or common catstail, when growing in pastures that are uniformly moist, has a fibrous root, for it is locally supplied with a sufficiency of water; but in dry situations, or such as are only occasionally wet, its roots acquire a bulbous form, and thus instinctively accommodates the plant with a natural reservoir. And there are various other grasses, as the alopecurus *geniculatus*, or geniculate foxtail, that exhibit the same curious adaptation.

Instinct may therefore be defined to be the operation of the principle of organized life by the exercise of certain natural powers directed to the present or future good of the individual; and reason, the operation of the principle of intellectual life, by the exercise of certain acquired powers directed to the same end. Both equally answer their object, are equally perfect in their kind, and equally display their common origin.

Instinct, however, has as often been confounded with *feeling*, or *sensation*, as it has with *perception*, which is the outline or foundation of reason; and hence another source of those perplexities and errors in distinguishing between animal and vegetable life—perplexities and errors which have been productive of the most absurd and disgusting consequences, and especially in regard to the delicate and elegant science of botany.

Instinct, sensation, and perception, are all principles essentially different; they may, indeed, exist conjointly, but each of them is capable of existing separately. Instinct is the common law or property of organized matter, as gravitation is of unorganized; and the former bears the same analogy to sensation and perception as the latter does to crystalization and chemical affinity. Instinct is the general faculty of the organized mass as gravitation is on the unorganized mass; sensation and perception are peculiar powers or faculties appertaining to the first, as crystalization and affinty are appertaining to the second; they can only exist under certain circumstances of the organized or unorganized matter to which they respectively belong.

Whence derive the young of every kind a knowledge of the peculiar powers that are to appertain to them hereafter, even before the full formation of the organs in which those powers are to reside? To adopt the beautiful language of the first physiologist of Rome,

> The young calf whose horns
> Ne'er yet have sprouted, with his naked front
> Butts when enraged: the lion-whelp or pard
> With claws and teeth contends, ere teeth or claws
> Scarce spring conspicuous: while the pinion'd tribes
> Trust to their wings, and, from th' expanded down,
> Draw, when first fledged, a tremulous defence.

In like manner an infant, in danger of falling from its nurse's arms, stretches out its little arms to break the fall, as though acquainted by experience with such an action. We here meet with an instance of pure instinct; but we pursue the same conduct in adult age, and we have then an example of instinct combined with intelligence; and intelligence, instead of opposing the instinctive exertion, encourages and fortifies it. So when caterpillars, observes Mr. Smellie, are shaken from a tree, in whatever direction they descend, they all instantly turn towards the trunk and climb upwards, though till now they have never been on the surface of the ground.

The vegetable kingdom offers us examples of simple instinct equally singular and marvellous. Thus the stalk of the convolvulus twines towards the south; the phraseolus *vulgaris*, or kidney bean, pursues the same course: while the honey-suckle and the hop take a perfectly reverse direction. Who will reveal to us the cause of these differences?

Let us close these observations with a momentary glance at the very singular instinctive powers of the cancer *ruricola*, or land-crab. This is an inhabitant of the tropical regions, and especially of the Bahama Islands: it is gregarious, and associates in large bodies, that preserve an orderly society, for the most part in the recesses of inland mountains, though they regularly once a year march down to the sea-side in an army of some millions to deposit their spawn in the ocean. The time selected for this expedition is usual in the month of May, when they sally forth from the stumps of hollow trees, the clefts of rocks, and subterraneous burrows, in enormous multitudes. The whole ground, indeed, is covered with this reptile band of adventurers; and no geometrician could direct them to their destined station by a shorter course. They turn neither to the right hand nor to the left, whatever be the obstacles that intervene; and if they meet with a house, they will rather attempt to scale the walls than relinquish the unbroken tenor of their way. Occasionally, however, they are obliged to conform to the face of the country; and if it be intersected by rivers, they pursue the stream to its fountain head. In great dearth or rain they are compelled to halt, when they seek the most convenient encampment, and remain there till the weather changes. They make a similar halt when the sun shines with intense heat, and wait for the cool of the evening. The journey often takes them up three months before they arrive on the sea coast; as soon as they accomplish which, they plunge into the water, shake off their spawn upon the sands, which they leave to nature to mature and vivify, and immediately measure back their steps to the mountains. The spawn, thus abandoned, are not left to perish: the soft sands afford them a proper nidus; the heat of the sun and the water give them a birth; when millions of little crabs are seen crawling to the shore, and exploring their way to the interior of the country, and thus quitting their elementary and native habitation for a new and untried mode of existence. It is the marvellous power of in-

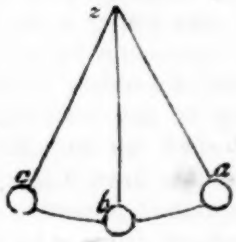
stinct that alone directs them, as it directed the parent hosts from whom they have proceeded; that marvellous power which is coextensive with the wide range of organic life, universally recognised, though void of sensation; consummately skilful, though destitude of intelligence; demanding no ground or developement of faculties, but mature and perfect from its first formation.

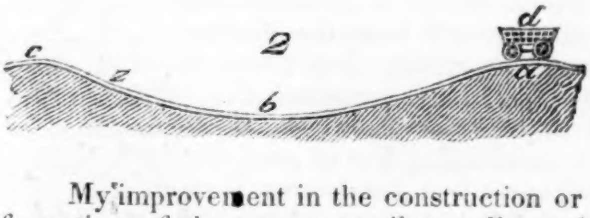
The general corollary resulting from these observations is as follows: that instinct, as I have already defined it to be, is the operation of the principle of organized life by the exercise of certain natural powers directed to the present or future good of the individual; while reason is the operation of the principle of intellectual life by the exercise of certain acquired powers directed to the same object; that it appertains to the whole organized mass, as gravitation does to the whole unorganized; equally actuating the largest and smallest portions, the minutest particles and the bulkiest systems, every organ and every part of every organ, whether solid or fluid, so long as it continues alive: that, like gravitation, it exhibits under particular circumstances different modifications, different powers, and different effects; but that like gravitation, too, it is subject to its own division of laws, to which under definite circumstances, it adheres without the smallest deviation; and that its sole and uniform aim, whether acting generally or locally, is that of perfection, preservation, or reproduction.

Of this mode of existence we know nothing: but as little do we know of the principle of gravitation of mind. We can only assure ourselves that they are distinct powers, perhaps distinct essence; and we see them acting, as well separately as conjointly, for the general good. Under their accordant influence we behold the plastic and mysterious substance of matter, which we must be especially careful not to confound with themselves, rising from "airy nothing" into entity: ascending from invisible elements into worlds and system of worlds; from shapeless chaos and confusion, into form, and order, and harmony; from brute and lifeless immobility, into energy and activity; into a display of instinct, feeling, perception; of being, and beauty, and happiness. One common design, one uniform code of laws, equally simple and majestic, equally local and comprehensive, pervades, informs, unites, and consummates the whole. The effect then being one, the mighty cause that produced it must be one also; an eternal and infinite unity—the radiating fountain of all possible perfections—ever active, but ever at rest—ever present, though never seen—immaterial, incorporeal, ineffable: but the source of all matter, of all kind, of all existences, and all modes of existence. Whatever we behold is God—all nature is his awful temple—all sciences the porticoes that open to it: and the chief duty of philosophy is to conduct us to his altar; to render all our attainments, which are the bounteous afflations of his spirit, subservient to his glory, and to engrave on the tablet of our hearts this great accordant motto of all natural and all revealed religion, of Athens and of Antioch, of Aratus and of St. Paul, "in him we live, and move, and have our being."—[Good's Book of Nature.]

Specification of a Patent granted to Richard Badnall, Junr. of England, for inventing a Propelling Power to enable Engines to ascend Hills on Railroads. [From the Repertory of Inventions, &c.]

Fig. 1.





My improvement in the construction or formation of the trams or rails, or lines of rail or tram roads, will be best illustrated by reference to the oscillation of a pendulum.

If a plummet, suspended by a string, as fig. 1, from the point *z*, be drawn away from the perpendicular line to the point *a*, and there let go, it will fall by its gravity in the arc, *a b*, but in its falling it will have acquired so much momentum as will carry it forward up to a similar altitude at the point *c*.

Let it be supposed that a line of rails or tram-way for carriage be so constructed from the summit of two hills, as fig. 2, across a valley, that the descent from one hill, as *c*, to the valley *b*, shall subtend a similar angle up the other hill, from the horizontal

line to the ascent up the hill, from *b* to *c*. Now, if a tram waggon, as *d*, be placed at the summit of the declivity *a*, it will, by its gravity alone, run down the descending line of rails to the lowest point *b*; but in so running, according to the principle of the oscillating pendulum, it shall have acquired a momentum that would carry it forward without any additional force, up the ascending line, to the summit of the hill, *c*, being at the same altitude as the hill, *a*. It is quite certain that this would really take place if the force acquired by the momentum was not impeded by the friction of the wheels of the carriage upon their axles, and upon the rails on which they run.

Hence subtracting the amount of friction as a retarding force from the momentum which the carriage has acquired in descending from *a* to *b*, it will be perceived that the force of momentum alone would only impel the carriage part of the way up the ascent *b c*, say as far as *z*. It must now be evident that the carriage *d* would not only pass down the descending line of road from *a* to *b* by its gravity, but the momentum acquired in the descent would also impel it up the second hill as far as *z*, unassisted by any locomotive power. In order, therefore to raise the carriage to the top of the second hill, I have only to employ such an impelling force as would be sufficient to draw it from *z* to *c*. If I employ a locomotive power to assist in impelling my carriage from *a* to *b*, I by that means obtain a greater momentum than would result from the descent of the carriage by gravity alone; and am enabled by that means to surmount the hill *c*, having travelled the whole distance from *a* to *c* on the undulating line of road, with the exertion of much less locomotive power than would have been requisite to have impelled the carriage the same distance upon a perfectly horizontal plane.

I claim as my invention the form of tram or rails, or lines of tram or rail road, in such undulating curve or curves as will enable me, in ascending hills, to combine and apply the advantages of momentum from gravity acquired in running down the descending curves of hills, with the propelling power of locomotive engines to be employed thereon, not confining myself to any particular extent of line or form of curve, but varying and adapting the curve or curves according to the surface of the country, or other local circumstances.

In witness, &c.

Improved Carriage Wheel Guard. [Communicated by the Inventor for the Mechanics' Magazine.]

Middleburg, Md. May 10, 1833.

Sir,—Having been informed that your paper is exclusively devoted to the publication of all new and important information connected with discoveries in mechanics, I have taken the liberty of inclosing you a description of my "Carriage Wheel Guard," an apparatus for which I have received "Letters Patent" from the Government of the United States. With this apparatus attached to wheeled carriages of all kinds, there is perfect safety and security from the occurrence of accident in case any derangement should take place in the running part. The great advantages to be derived by the travelling portion of the community, from the general introduction of this "Carriage Wheel Guard," must be obvious to the most superficial observer. Respectfully yours,

W. Zallickoffer, M. D.

Description.—This apparatus consists of a cylindrical flanged rim of iron, guards, a circular collar, and a semi-circular cap. The axle-tree and wheels are made in the usual manner. The cylindrical flanged rim of iron is either cast whole with the hub, or in sections, and screwed to its periphery in a groove, having two flanges, one on each side, raised sufficiently high to form a groove to receive the collar. The guards are made of iron, nearly in the form of the letter Z, and secured to the axle-tree by a joint and screw bolt. To each axle-tree there are four guards, two on each side. The circular collar, made of iron, is secured to the ends of the guards, and is put around the cylindrical rim in the groove formed by the flanges. A semi-circular cap, secured to the guards by hooks and staple, is put over the hub to prevent dirt falling in the groove around the rim. There are three other modes of applying the same principle described in the specification, which it is, perhaps, unnecessary here to notice, as they are not as likely to answer the purpose quite as well as the present described apparatus.

Operation.—The operation is thus:—When the axle-tree is whole, and the linch-pin, or nut, secure, then the wheel turns without touching any part of the guards or collar; but should the spindle of the axle-tree break, or the linch-pin or nut become disengaged, then the wheel would be pre-

vented from falling by the cylindrical collar on the ends of the guards put around the hub, between the flanges of the rim, as before described, and the wheel would continue to revolve, without any impediment except that created by the friction of the collar and rim. Should the axle-tree break at the shoulder of the spindle, or in any other part, the wheel will still be preserved in its ordinary position, but will become partially locked from the friction of the collar.—For a further illustration of my invention, I refer to the model and drawings of the same, deposited in the Patent Office, and to those (if more convenient) in my possession also.

Working Man's Companion. The Result of Machinery, namely, Cheap Production and Increased Employment, being an Address to the Working Men of the United Kingdom. Philadelphia, 1831, Carey & Hart, 18mo. pp. 215.

There is, perhaps, no more striking instance of the erroneous reasoning of a great portion of the civilized world, than that against the utility of labor-saving machines. Many suppose the tendency of those improvements that cheapen the products of the soil and arts is to lessen employment, and thereby become an injury to mankind; and when they can refer to what they have heard, seen, and experienced, they consider themselves infallibly right, yet nothing is further from the truth. They reason like the inhabitants of a valley whose horizon has for a long and tedious while been bounded by chilling and blasting clouds of rain and sleet, not believing that over all the country besides the sun is diffusing its genial and vivifying rays.

The book before us was published under the superintendence of the Society for the Diffusion of Useful Knowledge, and was occasioned by the destruction of agricultural machinery by the laboring classes in Great Britain. The object was to show them that in destroying labor-saving machines they were diminishing the sources of employment. Deeming it important that correct views should be as generally as possible entertained on this subject, we shall make a few extracts, which we trust our readers will find interesting. That in reference to printing, illustrates the effects of all similar improvements:

"It is about 350 years since the art of printing books was invented. Before that time all books were written by the hand. There were many persons employed to copy out books, but they were very dear, although the copiers had small wages. A Bible was sold for thirty pounds in the money of that day, which was equal to a great deal more of our money. Of course very few people had Bibles, or any other books. An ingenious man invented a mode of imitating the written books by cutting the letters on wood, and taking off copies from the wooden blocks by rubbing the sheet on the back; and soon after other clever men thought of casting metal types or letters, which could be arranged in words and sentences, and pages and volumes; and then a machine called a printing press, upon the principle of a screw, was made to stamp impressions of these types so arranged. There was an end, then, at once, to the trade of the pen and ink copiers; because the copiers in types, who could press off several hundred books while the writers were producing one, drove them out of the market. A single printer could do the work of at least two hundred writers. At first sight this seems a hardship, for a hundred and ninety-nine people might have been, and probably were, thrown out of their accustomed employment. But what was the consequence in a year or two? Where one written book was sold, a thousand printed books were required. The old books were multiplied in all countries, and new books were composed by men of talent and learning, because they could then find numerous readers. The printing press did the work more neatly and more correctly than the writer, and it did it infinitely cheaper. What then? The writers of books had to turn their hands to some other trade, it is true; but type-founders, paper-makers, printers, and book-binders, were set to work, by the new art or machine, to at least a hundred times greater number of persons than the old way of making books employed. If the pen and ink copiers could break the printing presses, and melt down the types that are used in London alone at the present day, twenty thousand people would at least be thrown out of employment to make room for two hundred at the utmost; and what would be even worse than all this misery, books could only be purchased, as before the invention of printing, by the few rich, instead of being the guides and comforters, and best friends, of the millions who are now within reach of the benefits and enjoyments which they bestow."

The following dilemma respecting the

horse churn justly excites risible emotions, and burlesques the deluded laborers themselves:

"Amongst the many accounts which the newspapers of December, 1830, give of the destruction of machinery by agricultural laborers, we read that, in the neighborhood of Aylesbury, a band of mistaken and unfortunate men destroyed all the machinery of many farms, *down even to the common drills*. The men conducted themselves, says the country newspapers, with civility; and such was their consideration, that they moved the machines out of the farm yards, to prevent injury arising to the cattle from the nails and splinters that flew about while the machinery was being destroyed. They *could not make up their minds* as to the propriety of destroying a horse churn, and therefore that machine was passed over. * * *

"Why should the laborers of Aylesbury not destroy the harrows as well as the drills? Why leave a machine which separates the clods of the earth, and break one which puts seeds into it? Why deliberate about a horse-churn, when they are resolved against a winnowing machine?"

The truth is, every implement or tool was once a *new* labor-saving machine.

"The chief distinction between man in a rude and man in a civilized state of society is, that the one wastes his force, whether natural or acquired,—the other economises, that is, saves it. The man in a rude state has very rude instruments—he therefore wastes his force: the man in a civilized state has very perfect ones—he therefore economises it. Would you not laugh at the gardener who went to hoe his potatoes with a stick, having a short crook at the end? It would be a tool, you would say, fit only for children to use. Yet such a tool was doubtless employed by some very ancient nations; for there is an old medal of Syracuse which represents this very tool. The common hoe of the English gardener is a much more perfect tool, because it saves labor. Could you have any doubt of the madness of the man who would propose that all iron hoes should be abolished, to furnish more extensive employ to laborers who should be provided only with a crooked stick cut out of a hedge? The truth is, if you, the working men of England, had no better tools than crooked sticks, you would be in a state of actual starvation. One of the chiefs of the people of New-Zealand, who, from their intercourse with Englishmen, had learnt the value of tools, told Mr. Marsden, a missionary, that his wooden spades were all broken, and he had not an axe to make any more; his canoes were all broken, and he had not a nail or a gimlet to mend them with; his potato grounds were uncultivated, and he had not a hoe to break them up with; and that *for want of cultivation*, he and his people would have nothing to eat. This shows you the state of a people without tools."

The effects of roads have a very great and decided tendency to advance the state of society:

"At Abbeyfeale and Brosna about half of the congregation at mass on Sundays were barefoot and ragged, with small straw hats of their own manufacture: felt hats being worn only by a few. Hundreds or even thousands of men could be got to work for sixpence a day, if it had been offered. The farmers were mostly in debt, and many families went to beg in Tipperary and other parts. The condition of the people is now very different; the congregations at the chapels are now as well clad as in other parts; the demand for labor is increased, and a spirit of industry is getting forward, since the new roads have become available."

To form a correct view of what constitutes labor-saving machinery, we must go back to the more simple condition of mankind. Our work says,

"We once met an old woman in a country district, tottering under the weight of a bucket, which she was laboring to carry up a hill. We asked her how she and her family were off in the world. She replied that she could do pretty well with them, for they could all work, if it were not for one thing—it was one person's labor to fetch water from the spring; but, said she, if we had a pump handy, we should not have much to complain of. This old woman very wisely had no love of labor for its own sake; she saw no advantage in the labor of one of her family being given for the attainment of a good, which she knew might be attained by a very common invention. She wanted a machine to save that labor. Such a machine would have set at liberty a certain quantity of labor which was previously employed unprofitably; in other words, it would have left her or her children more time for more profitable work, and then the family earnings would have been increased."

The next extract we make shows in a very striking manner how much the condition and employment of the whole world are affected by

the introduction of some simple machinery into a distant country:

"The creation of employment amongst ourselves by the cheapness of cotton goods produced by machinery is not to be considered as a mere change from the labor of India to the labor of England. It is a creation of employment, operating just in the same manner as the machinery did for printing books. The Indian, it is true, no longer sends us his calicoes and his colored stuffs; we make them ourselves. But he sends us forty times the amount of raw cotton that he sent when the machinery was first set up. In 1781 we imported five million pounds of cotton wool. In 1828 we imported two hundred and ten million pounds—enough to make twelve hundred and sixty million yards of cloth—which is about two yards apiece for every human being in the world. The workman on the banks of the Ganges, (the great river of India,) is no longer weaving calicoes for us, in his loom of reeds under the shade of a mango tree; but he is gathering for us forty times as much cotton as he gathered before, and making forty times as much indigo for us to color it with. The export of cotton has made such a demand upon the Indian power of labor, that even the people of Hindostan, adopting European contrivances, have introduced machinery to pack the cotton. Bishop Heber says, that he was frequently interested by seeing, at Bombay, immense bales of cotton lying on the piers, and the ingenious screw, by which an astonishing quantity is pressed into the canvas bags. The Chinese, on the contrary, from the want of these contrivances to press the cotton so close in bags, sell their cotton to us at much less profit; for they pack it so loosely that it occupies three times the bulk of the Indian cotton, and the freight costs twelve times the price on this account. When the Chinese acquire the knowledge from other nations, which their institutions now shut out, they will know the value of mechanical skill, in preference to unassisted manual labor."

It is asserted by this British work, that, "we buy three million and a half pounds of raw silk from the stranger, employ half a million of our own people in the manufacture of it by the aid of machinery, and sell it to the stranger, and to our own people, at a price as low as that of the calico of half a century ago." The time will soon come when half a million of the people of the United States will be employed in rearing the silk worm, and in manufacturing silk.

"There is an article employed in dress, which is at once so necessary and so beautiful that the highest lady in the land uses it, and yet so cheap that the poorest peasant's wife is enabled to procure it. The quality of the article is as perfect as art can make it; and yet, from the enormous quantities consumed by the great mass of the people, it is made so cheap that the poor can purchase the best kind, as well as the rich. It is an article of universal use. United with machinery, many hundreds, and even thousands, are employed in making it. But if the machinery were to stop, and the article were made by human hands alone, it would become so dear that the richest only could afford to use it; and it would become, at the same time, so rough in its appearance, that those very rich would be ashamed of using it. The article we mean is a *pin*."

Contrary to the impressions of many, it is a fact, as mankind progress in civilization their lives are prolonged. It is easy to see that science, philanthropy, and religion, will still continue to increase the number of years allotted to man:

"Savages, it is well known, are not long livers; that is, although there may be a few old people, the majority of savages die very young. Why is this? Many of the savage nations that we know have much finer climates than our own; but then, on the other hand, they sustain privations which the poorest man amongst us never feels. Their supply of food is uncertain, they want clothing, they are badly sheltered from the weather, or not sheltered at all, they undergo very severe labor when they are laboring. From all these causes savages die young. Is it not reasonable, therefore, to infer that if in any particular country the average duration of life goes on increasing, that is, if fewer people, in a given number and a given time, die now than formerly, the condition of that people is improved; that they have more of the necessaries and comforts of life, and labor less severely to procure them? Now let us see how the people of England stand in this respect. The average mortality in a year, about a century ago, was reckoned to be one in thirty; fifty years ago it was one in forty; thirty years ago one in forty-seven; twenty years ago one in fifty two; and now it is one in fifty-eight. You see, therefore, according to this estimate, of which there is no reason whatever to doubt the accuracy, that where one person dies in a year now,

two died a century ago. This remarkable result is doubtless produced in some degree by improvements in the science of medicine, and particularly by the use of inoculation for the small pox, and vaccination. But making every allowance for these benefits, the fact furnishes the most undeniable truth, that the people of England are infinitely better fed, clothed, and lodged, than they were a century ago, and that the labor which they perform is infinitely less severe."

Our limits will not permit us to do ample justice to this little volume; we must, however, find space for one more extract, which we most heartily recommend to the particular notice of our readers:

"The first thing that we say to every working-man is, get knowledge. By knowledge, we do not mean the arts alone of reading and writing, which are only the keys to knowledge, but that sound practical acquaintance with the elements of science, both moral and physical, which may give working-men a right knowledge of the things by which they are surrounded, and enable them to form a right estimate of their own capabilities and their own duties. By knowledge, neither do we mean only that acquaintance with books which refines and elevates the mind, but an acquaintance with every thing about them, and especially with the mechanical arts which properly belong to, or are allied with, their own trade. The first employment which we ask them to make of this practical knowledge is to acquire the readiness of shifting their occupation. It is not the increase of machinery, or the occasional glut of laborers, which alone compel the working-man to pass through a state of change. The caprices of fashion, which, upon the whole, create employment, also make that employment irregular. A change from metal buttons to silk buttons is alone sufficient to derange the industry of hundreds of workmen. What then is the remedy? Knowledge. The power of knowing what employments are in any degree allied to your own employments, and how your own employments may receive a new impulse from your own ingenuity. There are constant fluctuations, for instance, between the demands for silk and the demands for cotton. The spinners and weavers have learnt to adapt themselves to these fluctuations. At Manchester, at the present moment, there are twenty thousand men working at silk, who, two years ago, were working at cotton. We have seen how the lace-makers of Marlow, instead of struggling against the lace machine, applied themselves to embroider caps. In both these cases, these salutary changes of employment could not have been effected without a certain degree of knowledge. But the great advantage of such practical knowledge to you all is that you may strike out new sources of industry. Whenever you can do a thing better,—that is, when you can improve the quality of an article, and add to its cheapness,—you may be sure of creating a demand for it."

If our practical men will but follow the excellent advice here given, they will soon obtain their share of all those blessings which industry and science confer on mankind; and, to use the words of the eloquent Dr. Chalmers, "it will come through the medium of a growing worth and growing intelligence among the people. It will bless and beautify that coming period when a generation, humanized by letters, and elevated by the light of Christianity, shall, in virtue of a higher taste and a larger capacity than they now possess, cease to grovel among the sensualities of a reckless dissipation."

Societies for promoting Useful Knowledge, in Boston, Mass.—In Boston there are not less than fifteen institutions, with more or less of the nature and objects of Lyceums. The Mechanics' Association, which is the oldest institution of the kind in the city, has, as every Lyceum ought to have, benevolence for a part of its object. Besides the distribution of charity, it has had for several years a weekly course of lectures during the winter, which for the last season have been numerously attended by ladies as well as gentlemen. According to the constitution of this association, the members must be master mechanics.

The Mechanics' Institution has been in operation five or six years, and is furnished with a valuable set of apparatus at an expense of two or three thousand dollars. Since its organization, a course of lectures has been given annually, by gentlemen of extensive attainments in science and literature. To the lectures during the last season, ladies have been invited.

The Society for the Diffusion of Useful Knowledge has been organized about four years; since which time they have had an annual course of lectures on various subjects, which have been numerously attended. Several volumes have been published under the

patronage of this society, entitled The American Library of Useful Knowledge.

A Society for Natural History was organized about two years since, and have had three courses of lectures on the different departments of Natural History, highly acceptable to the auditors and spectators. This society is in a prosperous condition, and is soon to be furnished with commodious rooms for depositing their collections.

The Franklin Lectures have been given for two seasons, and very numerously attended.

The Young Men's Association for the Promotion of Literature and Science, though smaller in number than those already mentioned, is not less profitable or interesting to its members.

The Young Men's Benevolent Society unites literary improvement with aiding the poor, which is its principal object. It has been highly useful, and is now in a state of increasing prosperity.

The Boston Young Men's Society for Intellectual and Moral Improvement, which was organized but a few months since, has procured a respectable library and a commodious hall, and other rooms, where young men, especially strangers, are invited to resort, and where they are placed under the most favorable circumstances for social entertainment, by forming valuable acquaintances and enjoying good society, while they have great facilities for intellectual improvement.

The Boston Lyceum has had increasing prosperity since its first organization, four years since. It is distinguished from most or all the societies already named, by its being divided into various classes, for special objects, such as Natural Philosophy, Astronomy, Mathematics, Elocution, French Language, &c. It is also distinguished by their applying to none, or but a few, except the members of the society, for public lectures, which have been highly respectable, and given for four seasons.

The Mechanics' Lyceum, though from its object and constitution it is not large, has been highly successful in bringing forward young men to feel and exert their own powers, which has, of course, resulted in the true elevation of character, of most if not all its members. The plan of this Lyceum is to have all the members take a part in its exercises.

Among other results of the Mechanics' Lyceum, is a periodical under the name of the Young Mechanic, which is eminently of a practical and useful character, and has a growing patronage and popularity.

Another society which is not less deserving or prosperous than either of those already mentioned, is the Mechanic Apprentices' Library Association. This society was originally connected with the Mechanics' Charitable Association, the one first mentioned; but for a year or two past it has been independent of its parent, and has set up business for itself, and has found, by its greatly increased prosperity, that it is quite competent to carrying it on. Besides the library, which is large, it has some apparatus, and has recently commenced a cabinet of natural and artificial productions.

A weekly course of lectures by the apprentices themselves is well sustained, and sufficiently interesting and attractive to draw full meetings of ladies and gentlemen. This society has classes, especially for the younger members to become acquainted with the common and practical branches of education. It is particularly worthy of remark, that since meetings for lectures and study have been held, a greatly extended and increased interest has been given to the library. Books of a certain class, which before were scarcely taken from the shelves from one year to another, have now become the most interesting as well as the most useful in the library. At a late anniversary of this Apprentices' Lyceum, an orator and a poet, both from their number, furnished an entertainment to a crowded hall of ladies and gentlemen, which would have done credit to older heads and more regularly trained scholars. This society has set an example worthy to be followed by any Lyceum in any place. Many Lyceums of a social character have been fraught with advantages of the highest value.

Social Lyceums. It may well be doubted if the social, the intellectual, the refined, the amiable, and the moral qualities of our nature have ever been more beautifully blended, or more happily exhibited, than in some small circles of ladies and gentlemen, associated for the double purpose of social intercourse and intellectual improvement. Free from the empty ceremony and the heartless compliments of fashionable parties, and the restraint and formality of large assemblies, they enjoy all the advantages of the one without the evils of the other. They are sufficiently free and unrestrained to be social and animated, and sufficiently formal to confine the conversation within certain limits

and to render it in the highest degree entertaining and instructive.

Ten Rules to be observed in Practical Life.—The following rules were given by the late Mr. Jefferson, in a letter of advice to his namesake, Thomas Jefferson Smith, in 1825:—

1. Never put off till to-morrow what you can do to-day.
2. Never trouble others for what you can do yourself.
3. Never spend your money before you have it.
4. Never buy what you do not want because it is cheap.
5. Pride costs us more than hunger, thirst, and cold.
6. We never repent of having eaten too little.
7. Nothing is troublesome that we do willingly.
8. How much pains have those evils cost us which never happened.
9. Take things always by their smooth handle.
10. When angry, count ten before you speak—if very angry, a hundred.

The Crafts of Germany.—The different crafts in Germany are incorporations recognised by law, governed by usages of great antiquity, with a fund to defray the corporate expenses, and, in each considerable town, a house of entertainment is selected as the house of call, or harbor, as it is styled, of each particular craft. Thus you see in the German towns a number of taverns indicated by their signs, as the Masons' Harbor, the Blacksmiths' Harbor, &c. No one is allowed to set up as a master workman in any trade, unless he is admitted as a freeman or member of the craft; and such is the stationary condition of most parts of Germany, that no person is admitted as a master workman in any trade, except to supply the place of some one deceased, or retired from business. When such a vacancy occurs, all those desirous of being permitted to fill it present a piece of work, executed as well as they are able to do it, which is called their master-piece, being offered to obtain the place of a master workman. Nominally, the best workman gets the place; but you will easily conceive, that, in reality, some kind of favoritism must generally decide it. Thus is every man obliged to submit to all the chances of a popular election, whether he shall be allowed to work for his bread; and that, too, in a country where the people are not permitted to have any agency in choosing their rulers. But the restraints on journeymen, in that country, are still more oppressive. As soon as the years of apprenticeship have expired, the young mechanic is obliged, in the phrase of the country, to *wander* for three years. For this purpose he is furnished, by the master of the craft in which he has served his apprenticeship, with a duly-authenticated wandering book, with which he goes forth to seek employment. In whatever city he arrives, on presenting himself with his credential, at the house of call, or harbor, of the craft in which he has served his time, he is allowed, gratis, a day's food and a night's lodging. If he wishes to get employment in that place, he is assisted in procuring it. If he does not wish to, or fails in the attempt, he must pursue his wandering; and this lasts for three years before he can be anywhere admitted as a master. I have heard it argued, that this system had the advantage of circulating knowledge from place to place, and imparting to the young artisan the fruits of travel and intercourse with the world. But, however beneficial travelling may be, when undertaken by those who have the taste and capacity to profit by it, I cannot but think that, to compel every young man who has just served out his time to leave his home, in the manner I have described, must bring his habits and morals into peril, and be regarded rather as a hardship than as an advantage. There is no sanctuary of virtue like home.—[From Everett's Address.]

Smoky Chimnies.—He that can keep his body warm, and his temper cool, in a smoky room, in a cold, stormy, winter's day, has less of poor human nature in his composition than most men. Of all the evils "that flesh is heir to," deliver us from a smoky house, and its concomitants, a scolding wife, and ill-natured, peevish, squalling children. Some chimnies draw well except when the wind comes from a particular quarter; but the moment it veers round, and gets into that quarter, down it comes, puff after puff, and the whole house is immediately filled with smoke; from this there is no possibility of escaping unless one flees to the street and encounters the pelting storm, or, which is still worse, resorts to the neighboring tavern, and there, like Tam O'Shanter, plants himself "fast by the ingle, bleezing finely."

These kind of chimnies can be remedied by the following apparatus. Over the top of the chimney fix an upright iron pipe, like that of a stove-pipe, only larger, so that it will turn easily; to the top of this, and at right angles with it, attach another, open at both ends, and having a communication between the two; inside of this last must be inserted a trumpet-shaped tube, the large end of which must just fit, and be fastened to the pipe, in which it is inserted, and the small end extended over and beyond the mouth of the first, or perpendicular pipe, but not quite to the end of the one in which it is inserted. It must be remarked, that the top or horizontal pipe should be so attached to the perpendicular one as to have what we may call the escape end extend from it considerably farther than the mouth end. To complete the apparatus, attach a piece of sheet-iron to the escape end of the horizontal pipe, large enough to cause the whole to traverse like a vane, by which means the mouth will always be presented to the wind, and a current passing through the trumpet-shaped tube, over and beyond the flue of the chimney, which will produce a draught, and carry off the smoke. With this apparatus, provided it traverses well, it is impossible that a current of air can ever get into and pass down the chimney, while a current proportioned to the strength of the wind will always be passing over the top of the chimney, and forcing the smoke off as it rises.

Mutual Instruction.—The following account of a Literary Society, the members of which belong to the working class, is condensed from a paper addressed to the proprietors of large manufactories by the Secretary of the Glasgow Chamber of Commere.

It is justly remarked by this gentleman that the mere acquisitions of reading and writing only serve to open the door to knowledge; and, unless we are induced to pass the portal, the stores which lie within will still remain useless to us. No efforts, however assiduous, for acquiring intellectual treasures in the exercise of our mental powers, can be so successful or satisfactory as where men unite together to grapple with ignorance, and mutually to instruct each other. The formation of societies for this purpose cannot be too strongly recommended. An account of such an institution formed in Glasgow for the improvement of a single body of workmen will strongly illustrate these remarks.

The Gas Light Chartered Company of that city constantly employs between sixty and seventy men in the works; twelve of these are mechanics, and the others furnace-men and common laborers of different descriptions. In 1821 the manager of the works proposed to these men to contribute each a small sum monthly, to be laid out in books to form a library for their common use. He informed them that if they agreed to this, the Company would give them a room to keep the books in, which should be heated and lighted for them in winter; that in this room they might meet every evening throughout the whole year to read and converse, in place of going to the alehouse, as many of them had been in the practice of doing; that the Company would further give them a present of five guineas to expend on books; and that the management of every thing connected with the measure should be intrusted to a committee of themselves, to be named and renewed by them at fixed periods. Fourteen of the workmen were induced to agree to the plan. A commencement was thus made. For the first two years, until it could be ascertained that the members would take care of the books, it was agreed that they should not remove them from the reading room, but that they should meet there every evening to peruse them. After this period, however, the members were allowed to take the books home; and they then met only twice a week at the reading room, to change them, and converse upon what they had been reading. The increase of the number of subscribers to the library was at first very slow, and at the end of the second year the whole did not amount to thirty, but from conversing twice a week with one another at the library, upon the acquisitions they had been making, a taste for science and a desire for information began to spread among them. They had, a little before this time, obtained an Atlas, which, they say, led them to think of a pair of Globes. One of their members, by trade a joiner, who had had the advantage of attending two courses of lectures in the Andersonian Institution, volunteered, on the third year after the formation of the society, to explain to its members the use of the Globes. This he did one evening in every week, and succeeded so well that he offered, on the other meeting in the week, to give an account of some of the principles and processes in mechanics and chemistry, accompanied with a few experiments. He next, and while he was still going on with his lectures,

undertook, along with another of the workmen, to attend in the reading-room during the other evenings in the week, and teach arithmetic to such of the members as chose. The society now made very rapid progress, and its members were induced to make a new arrangement, by which the labor of instructing was more equally divided.

The individuals of the committee agreed among themselves to give in rotation a lecture either on chemistry or mechanics every Thursday evening, taking Murray for their text-book in the one, and Fergusson in the other. The plan is still pursued. It is intimated a fortnight before to the person whose turn it is, that he is to lecture from such a page to such a page of one of these authors. He has, in consequence, these fourteen days to make himself acquainted with the subject; and he is authorized to claim, during that period, the assistance of every member of the society in preparing the chemical experiments, or making the little models of machines for illustrating his discourse.

It is a remarkable circumstance in this unique process of instruction, that there has been no backwardness found on the part of any of the individuals to undertake to lecture in his turn, nor the slightest diffidence exhibited in the execution. This is attributed solely to its being set about without pretension or affectation of knowledge, and merely as a means of mutual improvement.

On the Monday evenings the society has a voluntary lecture from any one of its members who chooses to give notice of his intention, on either of the branches of science already mentioned, or upon any other useful subject he may propose. And there is with the general body the same simple unhesitating frankness, and disposition to come forward in their turn, that exist among the members of the committee with regard to the lectures prescribed to them. It may be interesting as well as useful to mention some of the subjects of the different lectures that were given during the first three months after this plan was adopted. Those delivered by the members of the committee consisted of eleven on mechanics, including the application of the mechanical powers; one on magnetism and electricity; one on wheel carriages; one on the primitive form of crystals; and one on hydrostatics. The voluntary lectures treated on the air pump, chemistry, &c., besides many practical subjects, such as boring and mining; Sir Humphrey Davy's lamp; the construction of a corn mill; and a description of Captain Manby's invention for the of shipwrecked seamen.

The effect of this society was soon found to be most beneficial to the general character and happiness of the individuals composing it. It may readily be conceived what a valuable part of the community the whole of our manufacturing operatives might become, if the people employed in every large work were enabled to adopt similar measures. What might we not then be entitled to look for, in useful inventions and discoveries, from minds awakened and invigorated by the self-discipline which such a mode of instruction requires.

The Gas Company being fully aware of the beneficial consequences resulting from the instruction of their work-people, fitted up for their use, in the latter end of 1824, a more commodious room for their meetings, with a small laboratory and workshop attached to it, where the experiments are conducted, and the models to be used in the lectures are prepared. Previously to this time the men had made for themselves an air-pump and an electrifying machine, and some of them are constantly engaged in the laboratory and workshop during their spare hours. At the end of three years from its commencement, the whole of the workmen, with the exception of about fifteen, became members of the society, and these were withheld from joining in consequence of their inability to read. The others said to them, "Join us, and we will teach you to read." It is gratifying to know that this invitation has not been made in vain; and that at the present time this association, now amounting to upwards of seventy persons, comprehends nearly all those employed about the works.

The rules of the society, which have been framed by the members themselves, are simple and judicious. Every person on becoming a member pays seven shillings and sixpence of entrance money. This sum is taken from him by instalments, and is paid back to him should he leave the gas works, or to his family or heirs should he die. Besides this entrance money, each member contributes three halfpence weekly, two-thirds of which go to the library, and one-third to the use of the laboratory and workshop. The weekly lectures are continued during the winter months, and the members are permitted to bring to these any of their sons who are above seven and under twenty-one years of age. Additions have from time to time been made to the chemical and mecha-

nical apparatus, and the library now contains seven hundred volumes.

Economy.—"A slight knowledge of human nature will show," says Mr. Colquhoun, "that when a man gets on a little in the world he is desirous of getting on a little further." Such is the growth of provident habits that it has been said, if a journeyman lays by the first five shillings his fortune is made. Mr. William Hall, who has bestowed great attention on the state of the laboring poor, declares he never knew an instance of one who had saved money coming to the parish. And he adds, moreover, "those individuals who save money are better workmen: if they do not the work better, they behave better and are more respectable; and I would sooner have in my trade a hundred men who save money, than two hundred who would spend every shilling they get. In proportion as individuals save a little money their morals are much better; they husband that little, and there is a superior tone given to their morals, and they behave better for knowing they have a little stake in society." It is scarcely necessary to remark, that habits of thoughtfulness and frugality are *at all times* of immense importance.—[Wilderspin's Early Discipline.]

Saturday Night's Wages.—The system frequently pursued in manufacturing towns in paying the wages of Mechanics, is not, perhaps, calculated to give to these all the advantages which they should derive from their hard earnings.

It is the custom in many factories to pay the wages of the week at a neighboring public house on the Saturday evening, after the labors of the day are over. This duty, in a large establishment, is a work which necessarily occupies some time; and the most sober and well-disposed, those most anxious to take their earnings home to their families, cannot obtain their money in time for procuring the Sunday's meal before the usual hour of rest. After a hard day's labor, spent in domestic cares, and in rendering the dwelling in a fit state for the coming day, the weary housewife would gladly seek repose. Under this arrangement, however, she is obliged to encroach on the period which should be devoted to sleep, in order to make her requisite purchases, or to invade the quiet of the Sabbath morning with the petty cares of life, which, for that one day at least, should be laid aside.

This in itself is a great annoyance to the female part of the community; but it is light as air to them, compared with the more serious evil which the system carries in its train, and which they would gladly exchange for any personal inconvenience they might be called upon to endure.

Workmen of the most abstemious habits consider themselves in a manner constrained to take some refreshment in the house where they have just received money; and though they may spend but a trifle, that trifle would have been better bestowed in assisting to minister to the wants of those nearest and dearest to them. But what a temptation is held out to men of a less temperate character. Here the love of noisy fellowship is nourished, unfitting the mind for the quiet enjoyments of home. Here the habit of intoxication is gradually acquired and confirmed. While wives are anxiously waiting at the door of the house for those supplies which will enable them to furnish necessaries for their families, husbands are too often rioting within, forgetful of those ties which should prevent such a waste of time and money in selfish and degrading enjoyment; and when, at length, the expecting female does obtain the residue of the earnings which should have been appropriated to the support of her family for the ensuing week, she finds the sum fearfully diminished and inadequate for the purpose.

Many a watchful mother has had to mourn over the ruined prospects of a beloved son, whose first deviation from right was the loitering at the public house on the Saturday night; his former simple habits gradually turned into those of selfishness, and all its lamentable consequences. Many an affectionate wife has had to grieve at this wreck of her early happiness, first invaded by the Saturday night's temptation; while she is either left to struggle neglected and alone through the miseries of life, or called upon to endure more active ill-treatment from her inebriated partner.

It may be said we are rather exaggerating the picture; that a large proportion of those who gain their livelihood by working as mechanics are respectable, intelligent, and virtuous members of society. Most happily this is true; but we think a still farther number might be ranked in the same class, if the payment of wages were better regulated, while the comfort of the artisans, and that of their families, would at the same time be materially increased.

There can be little doubt that, were proprietors once convinced of the bad effects which arise from this plan, they would adopt one more conducive to the comfort of those by whose labor they are benefitted. A walk in a manufacturing town at twelve o'clock on the Saturday night would sufficiently expose the evils of this manner of payment. The shops are then still open, and harrassed females are seen flocking to them; the streets are crowded with people; and many women, with looks of distress, are still lingering at the doors of the pay-houses, in the vain hope of alluring home their truant husbands. The whole continues a scene of noise, bustle and confusion, long past the hour of midnight, and but ill-befitted to usher in the day of rest. How unlike the holy soothing repose of the Cotter's Saturday Eve, so beautifully described by Burns.

If payment of the week's earnings were made on the respective premises, instead of at a drinking-house, and on the Friday instead of the Saturday evening, all these evils might at once be avoided.

The men would have no temptation given them to spend their earnings away from their families—the women would be enabled to make their purchases on the Saturday, at the time most convenient for the purpose, and they would have one chance less for unhappiness.

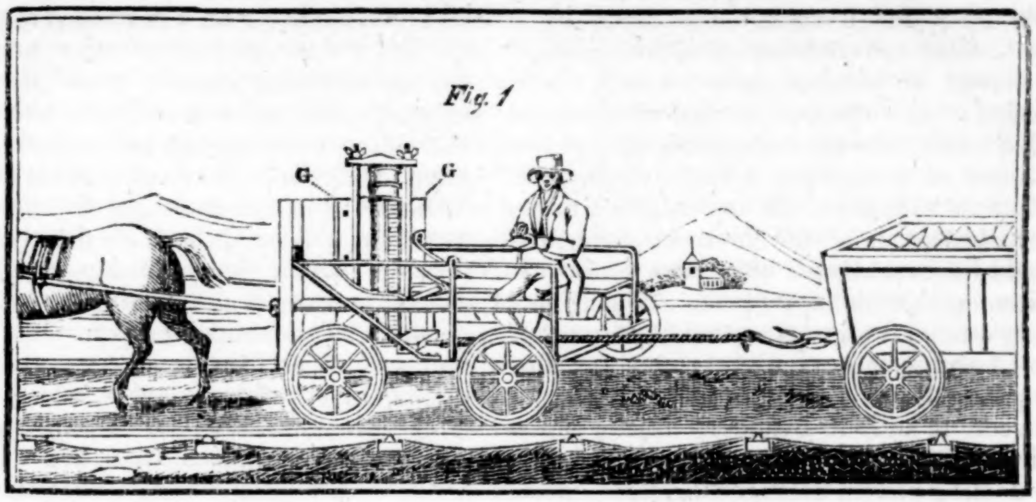
Two objections are made to this proposed alteration—the one moral, the other practical.

It is said that, with a well furnished pocket, a man not very industrious may be inclined to indulge himself in idleness during the ensuing day; but this would evince so total an absence of foresight and prudence, that the individual capable of such conduct would, we fear, when paid on the Saturday, in like manner take his holiday on the Monday, or just as long as his money might last.

The other objection arises from the mode in which the wages are usually paid at a large establishment. The required amount of money is in the first instance deposited in the hands of the confidential foreman, who does not pay each individual workman, but divides the whole in classes, and to a responsible man in each of these intrusts the sum due to his particular class: should the individuals of which this is composed be very numerous, he in his turn subdivides it, till at length the various claimants receive their due. The transaction is not, therefore, simply that of a proprietor paying his men, but it involves itself into a much more complicated form, and the men must necessarily have a common place of rendezvous to adjust their various accounts. That this difficulty may be obviated, and that it is in fact nearly as easy to pay on the premises as to adjourn to another house, we happen to be furnished with a practical proof. The proprietor of a large concern, not residing on the spot where it is carried on, had recently occasion to proceed to that place in order to examine more particularly how the works were conducted. He immediately perceived the bad effects arising from the system of paying the workmen at a drinking-house, and determined at once to abolish the practice. This intention was strongly combatted by the superintendant, who assured him that it was an impossibility to pay all the men at the works, for if the few to whom he delivered the money for their respective divisions were to receive it on the premises, they would of their own accord repair to the usual pay-house with those to whom the money was due, in order to make a settlement among themselves.

The gentleman persevered, however, in his intention; and on the day of payment, he himself, without any assistance, paid into the hands of each workman before he left the premises the wages due to him. He thus proved the practicability of the alteration, and acquired the right of insisting that henceforth the plan should always be pursued. By a little method, and by the aid of a few assistants, this work would of course be comparatively easy to one understanding its practical details; if in the absence of these advantages it was accomplished without any difficulty, in the manner we have described, by one quite new to the business, in an establishment where numerous workpeople are employed, it follows that this objection is of no weight.

To ascertain the height of a steeple, tower, &c.—Take two sticks of any but equal length, and holding one perpendicular, place one end of the other against its centre, so as to form a right angle with it; having done this, place your eye at the other end, and advance towards, or recede from, the object the height of which you wish to ascertain, until the upper and lower ends of the perpendicular stick shall appear to touch its top and bottom at the same time; then, from the spot on which you stand, measure the distance to the foot of the object, and this will be its exact height.



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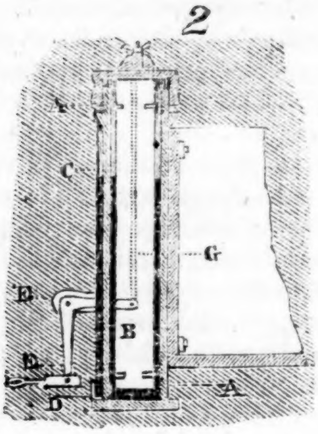

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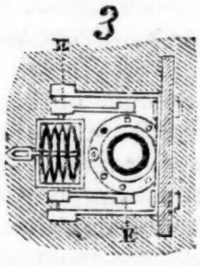

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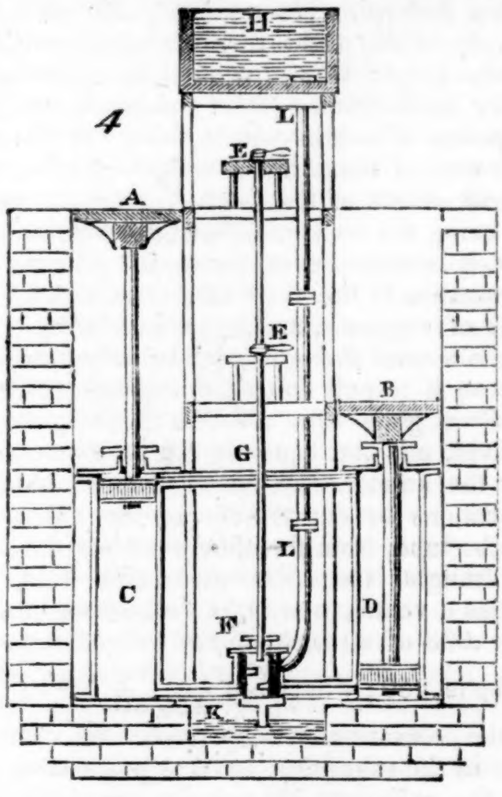


Milne's Mercurial Dynamometer, and Railway Lock for raising Carriages from one Level to another. [From the London Mechanics' Magazine.]

In our review of Mr. Milne's excellent "Practical View of the Steam Engine," we made mention of a mercurial dynamometer, for which Mr. M. had received the honorary gold medal of the Highland Society of Scotland. We now proceed to fulfil our promise of extracting from Mr. M.'s "Appendix" the following descriptive particulars of this instrument; and shall subjoin thereto an account of an ingenious apparatus which Mr. M. has also devised for raising or lowering railway carriages from one level to another.

THE DYNAMOMETER.—Practical engineers complain that those dynamometers which indicate the quantum of force applied by a horse upon a railway, by the inflection of springs, lose their elasticity when kept at work for a considerable time; the oscillations of the index-pointer, too, make it impossible to ascertain the medium of unequal draught applied by the animal in stepping out. Such also is the case when any other common instrument is used for this purpose. Both of these defects are completely obviated by the mercurial dynamometer now to be described. This instrument consists of a hollow metallic cylinder, A, fig. 2, in which is placed a floating piston, B, which should be about one-

tenth of an inch less in diameter than the cylinder in which it must move freely up or down. To prevent friction, four small rollers should be inserted into the side of this wooden float, both at its top and bottom; which rollers should not project further than to admit of the piston being "shake-free" within its cylinder. In order, also, to prevent absorption of the mercury, the wood should be coated with bees' wax mixed with whitening or with lamp-black. These things being attended to, and a portion of mercury placed within the cylinder, by pushing down the piston the fluid will ascend in a thin film between it and the cylinder, till the statical weight of the mercury, acting on the base of the floating piston, balances the force exerted in pushing it down. Hence, since the statical weight of the fluid increases reciprocally as the height to which it is caused to ascend by its displacing force, so must its various points of height within the cylinder be a measure of the force in equilibrio with the statical weight of the fluid.

Such being the construction of this dynamometer, it is only necessary to fix it in a vertical position to the front of the foremost of a train of waggons, and to turn the direction of the horses' draught in such a manner as to cause it to pull down the floating piston; while a glass tube exhibits the height of the fluid, and consequently the force exerted by the animal. To prevent any sudden elevations or depressions in the mercury in the tube, from the irregularity of the horses' draught, the socket in which it is placed has a ventricle at D, the diameter of which is .033 of an inch, while that of the glass tube is .250; wherefore $\frac{.250^2}{.033^2} = 57{\cdot}4$; hence the elevation or depression of the mercury in the tube must be 57·4 times less than in the cylinder; the celerity of which fluid, too, is still further reduced by springs attached to the draught-hook, as seen in the plan, fig. 3. Since this machine was first constructed, it has occurred to Mr. Milne that, by attaching a stop-cock, the celerity of the motion of the mercury in the glass tube could be regulated to any required extent with the utmost exactness. In addition to these contrivances, oscillations of the fluid might be still further prevented by making the yoke-levers, E, shorter than those which pull down the piston. The friction of the arbor, F, might also be much lessened, by making its extremities similar to the bearing-pivots of a common balance.

Mr. Granger, the engineer, having placed this dynamometer on a carriage (represented in fig. 1) so constructed that neither the weight of the instrument nor of the persons upon it should affect the results, made a number of very interesting and useful experiments with it on the Kirkintilloch Railway. The first object in these experiments was to ascertain the capabilities of the dynamometer; on which head nothing can be more satisfactory than the testimony Mr. G. has given. "It is altogether superior," he says, "to any other I have seen; and it is the opinion of several engineers, who have seen it at work, that it is the best instrument for engineering purposes that has ever been tried." A long and circumstantial narrative of these experiments is given, but it is only necessary that we should here place before our readers the principal facts which they have established with respect to friction on railways:

1. The medium friction of a train of five waggons on a level part of the railway was 9 lbs. per ton; while on a curved part, with a radius of about 800 feet, it was 18 lbs. per ton.

2. A draught of 10·8 lbs. per ton was required to travel at the rate of three miles an hour when the rails were dry, and only 6·8 lbs. when wet.

3. On a level the force exerted by horse was observed to vary from 90 to 110 lbs., but when the train came to a part of the railway which inclined at the rate of 1 in 280, the waggons descended freely by their own gravity.

4. On a descent of 1 in 117, a waggon with wheels 2·5 feet in diameter carried 1020 lbs. more weight than one with 3 feet wheels, at the same rate of speed and with the same power applied: but on a curve with a radius of a thousand feet, the 3 feet wheels proved superior to the 2·5—a circumstance which Mr. Milne ascribes to the axles of the 3 feet wheels being of two pieces, meeting within a bush at the centre, while the 2·5 wheels were attached by an inflexible axle, whence it followed, in the case of the former, that "all the wheels would roll upon the rails of different radii, independent of the motions of each other."

5. The average force of draught required on a level at 3·5 miles per hour was 8 lbs. per ton; at 6·66 miles, 9·5 lbs.; at 7·5 miles, 10·2 lbs.; at 8 miles, 10·67 lbs.; at 8·57 miles, 11·63 lbs.

The Railway Lock.—Let A and B, fig. 4, be two platforms, on which the waggons

are to be elevated or let down; A being at the upper level and B at the lower. C and D are two cast iron cylinders filled with water, and having water-tight pistons supporting the platforms, A and B. Suppose, now, that a train of waggons has been placed on the platform, B, to be raised to the upper level, and that a greater weight is about to descend upon A; then by turning the handle, E, of the fourway-valve, F, to a proper point on an index beneath it, the superior weight on A will press the water below its piston through the valve F into D, and thereby elevate the weight upon B; the fluid above the piston in D passing over into C by the pipe G. But suppose there is no counterweight ready to descend on A when it is required to raise a load on B, then by turning the handle E, the water in the cistern H will descend and press upon the piston D, while simultaneously the water above D will pass off through the pipe G into C, and the water below the piston in C will make its exit through one of the water-ways of the valve F. Or if, on the other hand, there should be a load descending on A when there is none ascending on B, the valve F has only to be turned in proportion to the load (a matter which practice would easily determine), when a corresponding weight of water will be driven from the cylinders up the pipe and into the cistern H; in which case the cylinders below the ascending platform will fill themselves from the well K. The power of a machine of this kind may be stated as being equal to the weight of a column of water whose base is equal to the height of the fluid in the pipe L; and were this pipe a transparent tube, with a graduated scale attached to it, the height of the fluid in the tube would clearly point out the quantity of weight incumbent on one or other of the platforms, *minus* the friction of the pistons.

General Education.—A strange idea is entertained by many that education unfits persons for labor, and renders them dissatisfied with their condition in life. But what would be said were any of the powers of the body to be in a certain case disused? Suppose a man were to place a bandage over his right eye—to tie up one of his hands—or to attach a ponderous weight to his legs—and, when asked the cause, were to reply, that the glance of that eye might make him covetous—that his hand might pick his neighbor's pocket—or that his feet might carry him into evil company—might it not be fairly replied, that his members were given to use, and not to abuse, that their abuse is no argument against their use, and that this suspension of their action was just as contrary to the wise and benevolent purpose of their Creator as their wrong and guilty application? And does this reasoning fail when applied to the mind? Is not the unemployed mental faculty as opposed to the advantage of the individual as the unused physical power? Can the difference between mind and matter overturn the ordinary principles of reasoning and of morals? Besides, how is man to be prepared for the duties he has to discharge? By mere attention to his body? Impossible. The mind must be enlightened and disciplined; and if this be neglected, the man rises but little in character above the beasts that perish, and is wholly unprepared for that state to which he ought to have aspired.—[Wilderspin's Early Discipline.]

Thus I Think. [From Locke's Miscellaneous Papers, published in his Life by Lord King.]

It is a man's proper business to seek happiness and avoid misery. Happiness consists in what delights and contents the mind; misery in what disturbs, discomposes, or torments it.

I will therefore make it my business to seek satisfaction and delight, and avoid uneasiness and disquiet; to have as much of the one and as little of the other as may be.

But here I must have a care I mistake not; for if I prefer a *short* pleasure to a *lasting* one, it is plain I cross my own happiness.

Let me then see wherein consists the most lasting pleasure of this life, and that, as far as I can observe, is in these things:

1st. Health,—without which no sensual (as opposed to intellectual) pleasure can have any relish.

2d. Reputation,—for *that* I find every body is pleased with, and the want of it is a constant torment.

3d. Knowledge,—for the little knowledge I have, I find I would not sell at any rate, nor part with for any other pleasure.

4th. Doing good,—for I find the well-cooked meat I eat to-day does now no more delight me, nay, I am diseased after a full meal; the perfumes I smelt yesterday now no more affect me with any pleasure; but the *good turn* I did yesterday, a year, seven years since, continues *still* to please and delight me as often as I reflect on it.

5th. The expectation of eternal and in-

comprehensible happiness in another world is that also which carries a constant pleasure with it.

If, then, I will faithfully pursue that happiness I propose to myself, whatever pleasure offers itself to me, I must carefully look that it cross not any of those five great and constant pleasures above mentioned. For example, the fruit I see tempts me with the taste of it that I love; but if it endanger my health, I part with a constant and lasting for a very short and transient pleasure, and so foolishly make myself unhappy, and am not true to my own interest.

Innocent diversions delight me: if I make use of them to refresh myself after study and business, they preserve my health, restore the vigor of my mind, and increase my pleasure; but if I spend all or the greater part of my time in them, they hinder my improvement in knowledge and useful arts, they blast my credit, and give me up to the uneasy state of shame, ignorance, and contempt, in which I cannot but be very unhappy. Drinking, gaming, and vicious delights will do me this mischief, not only by wasting my time, but by a positive injury endanger my health, impair my parts, imprint ill habits, lessen my esteem, and leave a constant lasting torment on my conscience; therefore, all vicious and unlawful pleasures I will always avoid, because such a mastery of my passions will afford me a constant pleasure greater than any such enjoyments, and also deliver me from the certain evil of several kinds, that by indulging myself in a present temptation I shall certainly afterwards suffer.

All innocent diversions and delights, as far as they will contribute to my health, and consist with my improvement, condition, and my other more solid pleasures of knowledge and reputation, I will enjoy, but no farther; and this I will carefully watch and examine, that I may not be deceived by the flattery of a present pleasure to lose a greater.

THE PRINTING PRESS IN TURKEY.—Mr. Mountstuart Elphinstone, in his very interesting Account of the Kingdom of Caubul, (a country near the higher waters of the Indus, between India and Persia,) and of the scattered Afghan tribes dependant thereon, gives the following anecdote of the Naikpeekhail, who, like the rest, profess the Mahometan religion, but are so barbarous that even reading is looked down on as an unmanly accomplishment among them.

"Some men of the Naikpeekhail found a Mollah, or doctor of the Mahometan faith, copying the Khoran, or their Bible, and not well understanding the case, they struck his head off, saying 'You tell us these books come from God, and here are you making them yourself.'"

The Turks are not quite so ignorant as this, but even they, not many years ago, when Sultan Selim introduced the art of printing, were led to believe that it was sinful to print the Khoran—that nothing but the pen and hand-writing could, without impiety, multiply the copies of their Scriptures.—Other works might go through the press, but unfortunately, at the time, the Turks read no book except the Khoran, and so the inestimable benefit of printing was to be thrown away upon them! This absurd prejudice originated in, or was kept alive by, the Turkish copyists, who gained a livelihood by transcribing the Khoran, each copy of which cost the people a hundred times as much as the copy the press could have afforded, and the printed copy, besides, would have been infinitely the more distinct and legible of the two.

The present Sultan, among his many reforms and improvements, has succeeded to set the press to work in earnest. Many elementary works have been printed, some three or four of a higher character, on History and general Geography, and now a newspaper (that novelty for the Turks!) comes regularly from the Sultan's printing offices, and is circulated through the vast empire. We are informed by a friend, who writes from Constantinople, that it is a very interesting sight to see the effects that have already sprung from these salutary measures. Instead of every coffee-house being crowded as it used to be, by idle, silent, stupified loungers, doing nothing but smoking their pipes, you find them now (in less numbers indeed, which is also a good thing,) occupied by men attentively reading the newspaper, or conning over "the last new work" neatly printed, and sold at a very cheap price. Before this, and almost up to last year, they were in the condition that all Europe was in four hundred years ago, or previously to the invention of printing, when only the comparatively rich could afford to buy a book or any thing to read. Even on the quays of the port, and in the bazaars of Constantinople, you now see Turks occupying their leisure moments with the productions of the press, which is thus becoming day by day more and more active.

We extract from the April number of the "London Repertory of Inventions," specifications of two patents recently obtained there, which we think will be useful to those who are concerned in constructing railways in this country, as well as iron founders, and in fact, to all who are in any way interested in the progress of internal improvements. If they are important (and we think they are), it will be a matter of gratification to us to elicit from some of our numerous subscribers their opinion as to the utility of them. From directors, and others engaged in constructing railways, we especially invite communications—no matter what view of the matter they take, our columns are open for their opinions, confident that by discussion the real value of the invention will be arrived at. We hope that our esteemed correspondents, Messrs. Bulkley and Sullivan, may here find something upon which they may "tilt the lance" once more.

Patent granted to Daniel and George Horton, Iron Masters, Leys Iron Works, Stafford co. England, for an improved Puddling Furnace, for the better production of manufactured iron, in the process of obtaining it from the pig.

These gentlemen have found that pig iron, having undergone the action of the refining furnace, requires a degree of heat for its refusion, in the process of puddling, so great that the materials of which this latter furnace is composed are very speedily destroyed or rendered useless. They conceive that the refining furnace may be altogether dispensed with; and they suggest a process whereby the puddling may be conducted on a more economical and efficient plan.

Their improvement is extremely simple in its principle. It is the excessive heat which destroys the furnace; therefore, their object is to disperse and carry off as much as possible of this heat from the furnace, without in the least lowering the temperature to which the iron must be submitted in the operation of puddling. Where it is possible to expose the whole external surface of the puddling furnace to the action of the atmosphere, its sides may be composed of plates of iron, fitly prepared, and the stream of atmospheric air will carry off a sufficient quantity of the heat to prevent the consumption of the material of the furnace.

Wherever such exposure is impossible, the patentees would surround their furnace with a series of pipes, so constructed as to serve as bridges for the furnace; and these pipes should be made to circulate rapidly a strong force of water, perpetually supplied, and regularly carried off as it becomes heated. Of course, other means might be suggested; any good conductor of heat may be applied to the surface of the furnace, and the superfluous caloric may be carried off by radiation or otherwise.

They commence their process by throwing on to the bars of the furnace a quantity of the slag, ore, or scoria of the smelting furnace, and when that is in a state of fusion they throw in the pig iron, without its having undergone the usual operation of refining. When it is melted, the heat is increased until the iron boils; and the puddler works it until the slag or earthy matter is all carried away, and the iron remains pure: it is then ready for the forge hammers, or other proofs of its malleability. The patentees claim as their invention, only, the carrying off some portion of the heat from the exterior of the furnace itself, and that by means of atmospheric exposure, or aqueductory pipes.

Patent granted to Geo. Jones & Co., of Wolverhampton, Stafford co., England, for an improvement in making malleable iron.

This patent carries much further the simplifying process than that granted to the Messrs. Hortons. The practical men who have united in securing its advantages to themselves, have seen, like Messrs. Hortons, the uselessness of the refining furnace, but they purpose to carry the metal, in its first fusion, at once from the smelting furnace to the puddling furnace. They have no pigs at all: pig iron is a waste of time and material.

There is no occasion, they say, to use fuel to heat over again the iron after it has cooled in the form of pigs. They would have it retain the heat of the smelting furnace, and thence they would carry it by hand, in ladles, or in pails, or by any other utensil adapted to the purpose, at once to the puddling furnace.

If the accidents of place would permit, they could, of course, prefer the obvious plan of carrying the smelted metal by a pipe, or channel, or drain, from the one furnace to the other, and this they would claim as a part of their invention. Now, it so happens, that this system has, to our certain knowledge, been acted on for upwards of twenty years, and that in more places than one. However, *publication alone* insures private right. It is remarkable that two patents

should have been granted on succeeding days for purposes acting so exactly on each other; their combination would be a yet greater improvement. In both cases the refining is dispensed with. If portability be no object, and local circumstances are favorable, these plans will effect a great saving of time and money.

To render Leather, Linen, &c. water-proof.—Take 100 lbs. of the best linseed oil; add one and a half pounds of acetate of lead, one and a quarter pounds of calcined amber, one and a half pounds of white lead, and one and a half pounds of very finely powdered pumice-stone. These solid substances, well ground and mixed together, must be boiled in the oil for ten hours, over a moderate fire, to prevent the oil from burning. This varnish should be of such a consistence, that, when mixed with a third part of its weight of pipe clay, it will be as thick as treacle. It is left to settle eight days, and is then passed through a lawn sieve. The next process is to grind, in a solution of strong and clear glue, as much pipe clay as amounts in weight to the tenth part of the oil employed, and to mix it to the consistence of ointment; adding the varnish by degrees, and stirring it well with a wooden spatula or stick. This varnish must be repeatedly stirred, till it becomes perfectly fluid; and then the desired tint is given by adding a fourth part of the color, ground in oil.

The linen must be stretched upon a wooden frame; and the composition applied upon it with a large spatula, three inches broad and nine inches long. The frame is then inverted, and the operation repeated upon the other side of the cloth: it is then left to dry for a week, and separated from the frame for use.

This cloth may be used for covers for carriages, &c.

For leather and skins, the same composition is used; but to give to the surface a smooth and brilliant appearance, the following varnish is employed. Take five pounds of the oil varnish, and an equal weight of well clarified resin; boil them together until the resin is dissolved; then add two pounds of oil of turpentine, having the color to be given to the varnish ground with it, and passed through a lawn sieve. This varnish is to be applied with a brush. When the varnish is thoroughly dry, it must be rubbed even with a pumice stone and water, and then washed clean. Two or three coats of varnish being then applied, and each coat suffered to dry for two or three days, is sufficient to produce a brilliancy equal to that of the Japan lacker.—[Bulletin de l'Industrie.]

Water in the Desert.—Among those improvements of the age which afford pleasing topics of contemplation is the following, taken from the Boston Transcript: Two persons who understood the business of boring for water, were lately taken to Egypt, by Mr. Briggs, then consul at Cairo. They were employed, under patronage of the Pacha, to bore for water in the Desert. "At about thirty feet from the surface (says the Repertory of Patent Inventions) they found a stratum of sand stone; when they got through that, an abundant supply of water was procured. We believe the experiment has succeeded at every place where it has been made. The water is soft and pure." In the Desert of Suez a tank has been made, of 2,000 cubic feet contents, and several others are in building.

It is a question worthy of philosophical consideration, what may be the effect of this discovery on the civilization of Egypt and Arabia—the fertilization of the soil—the increase of population—and the advantages derived by that commerce to which the barren and arid deserts have presented so many obstacles.

A companion that is cheerful, and free from swearing and scurrilous discourse, is worth gold. I love such mirth as does not make friends ashamed to look upon one another next morning; nor men, that cannot well bear it, to repent the money they spend when they be warmed with drink. And take this for a rule: you may pick out such times and such companions, that you may make yourselves merrier for a little than a great deal of money; for "'tis the company and not the charge that makes the feast."—[Izaak Walton.]

Imitation of Nature.—When Smeaton rebuilt the Eddystone lighthouse, he took much time in considering the best method of grafting his work securely on the solid rock, and giving it the form best suited to secure stability: and one of the most interesting parts of his interesting account is that in which he narrates how he was led to choose the shape which he adopted, by considering the means employed by Nature to produce stability in her works. The building is modelled on the trunk of an oak, which spreads out in a sweeping curve near the roots, so as

to give breadth and strength to its base, and again swells out as it approaches to the bushy head, to give room to the strong insertions of the principal boughs. The latter is represented by a curved cornice, the effect of which is to throw off the heavy seas, which being suddenly checked fly up, it is said, from 50 to 500 feet above the top of the building, and thus to prevent their striking the lantern even when they seem entirely to enclose it. The efficacy of this construction is such, that after a storm and spring-tide, of unequalled violence, in 1762, in which the greatest fears were entertained at Plymouth for the safety of the lighthouse, the only article requisite to repair it was a pot of putty, to replace some that had been washed from the lantern.—[Gallery of Portraits, with Memoirs.]

Dr. Franklin's Moral Code.—The great American philosopher and statesman, Benjamin Franklin, drew up the following list of moral virtues, to which he paid constant and earnest attention, and thereby made himself a better and a happier man :—

Temperance.—Eat not to fulness ; drink not to elevation.

Silence.—Speak not but what may benefit others or yourself; avoid trifling conversation.

Order.—Let all your things have their places ; let each part of your business have its time.

Resolution.—Resolve to perform what you ought ; perform without fail what you resolve.

Frugality.—Make no expense, but do good to others or yourself; that is, waste nothing.

Industry.—Lose no time ; be always employed in something useful ; cut off all unnecessary actions.

Sincerity.—Use no hurtful deceit ; think innocently and justly ; and if you speak, speak accordingly.

Justice.—Wrong none by doing injuries, or omitting the benefits that are your duty.

Moderation.—Avoid extremes ; forbear resenting injuries.

Cleanliness.—Suffer no uncleanliness in body, clothes, or habitation.

Tranquility.—Be not disturbed about trifles, or at accidents common or unavoidable.

Humility.—Imitate Jesus Christ.

The same great man likewise drew up the following plan for the regular employment of his time ; examining himself each morning and evening as to what he had to do, what he had done, or left undone ; by which practice he was better able to improve his future conduct :—

Morning.	*Hours.*	
The question, What good shall I do to-day?	6, 7, 8	Rise, wash, and address Almighty God! contrive the day's business, and take the resolution of the day; prosecute the present study; and breakfast.
	9, 10, 11, 12	Work.
	1, 2	Read and look over my accounts, and dine.
	3, 4, 5, 6, 7	Work.
Evening.	*Hours.*	
The question, What good have I done to-day? what have I left undone which I ought to have done?	8, 9, 10	Put things in their places; amusement; supper; examination of the day; address the Almighty.
	11, 12, 1, 2, 3, 4, 5	Sleep.

A steady perseverance in *some plan* for the arrangement of our time, adapted to circumstances, cannot fail improving our general conduct in life, and rendering us better members of society, and better Christians.

When we read the lives of distinguished men in any department, we find them almost always celebrated for the amount of labor they could perform. Demosthenes, Julius Cæsar, Henry the Fourth of France, Lord Bacon, Sir Isaac Newton, Franklin, Washington, Napoleon,—different as they were in their intellectual and moral qualities, were all renowned as hard workers. We read how many days they could support the fatigues of a march ; how early they rose ; how late they watched ; how many hours they spent in the field, in the cabinet, in the court ; how many secretaries they kept employed ; in short, how hard they worked.—[Everett's Discourse.]

Amount of Power lost by Curves on Railways. By S. D. To the Editor of the American Railroad Journal.

Sir,—A very curious and very necessary table remains still a desideratum in the science of railways, which I am inclined to believe the observations of experienced engineers would be able to furnish us with—I mean of the amounts of power lost by curves on railways. This loss, for the sake of a ready perception of its value, I would oppose to a relative inclination in this manner, which would, I imagine, bear to fully elucidate a very important section of that branch of engineering:

A curve of 5,000 feet radius is equal to a rise of, say	}	1 in 200
" 1,000	"	1 in 150
" 600	"	1 in 100
" 200	"	1 in 50, &c.

&c., always supposing the outer rail of the curve as in practice to be raised above the level of the inner rail.

I know that some experiments have been made with this view, but I have never met with an account of them, and, in common with many others, am anxious to learn the results of such experiments. It appears to me to be one of those chapters on railways least understood at present, and on which the greatest improvements remain yet to be effected. Very respectfully yours,

S. D.

Boston, May 12, 1833.

The subject referred to in the above communication we deem one of considerable importance, and shall be much obliged if some of our correspondents will furnish us with the desired information.—[Ed. R. J.]

Homer and Steam.—At the ninth anniversary of the London Mechanics' Institution, Dr. Birkbeck, in awarding a prize of £20 for the best essay on steam, observed, that the author had discovered several notices of the power of steam by the ancients, which had escaped preceding writers. He had also detected, in the eighth book of the *Odyssey*, a probable allusion to steam navigation:

"So shalt thou instant reach the realms assigned,
In wondrous ships, self-moved, instinct with mind:
No helm secures their course, no pilot guides;
Like man intelligent they plough the tides,
Conscious of every coast and every bay,
That lies beneath the sun's all-seeing ray.
Though clouds and darkness veil the encumbered sky,
Fearless through darkness and through clouds they fly,
High tempests rage, high rolls the swelling main,—
The sea may roll, the tempests rage in vain."

A Railway between Liverpool and London, we see by the English papers, is in contemplation, two bills being now before Parliament, which are represented as likely to receive the legislative sanction. The Liverpool Times remarks, that the joint work, to be undertaken by the managers of the Birmingham and Liverpool Line, when finished, "will be one of the noblest triumphs of science ever achieved, and one of the most important public benefits ever conferred by science on this country. In a few years Liverpool will probably be within twelve hours' ride of London. We shall be able to quit this place at six in the morning, and dine in the metropolis; or if night travelling should come into fashion, to ensconce ourselves snugly in the corner of a railway carriage in the evening, and awake next morning in Fleet street or the Strand. As for Birmingham, it will be a mere morning's ride either from London or Liverpool. This railway will also shorten the time of communication between the English and Irish capitals to twenty-four hours, so that London and Dublin will be as near for all practical purposes as London and Birmingham were fifty years ago, or as London and Liverpool are at present."

Improvements in Baking.—Some important improvements in the process of baking bread on a large scale have been recently put in operation in an English city. The same principles and similar apparatus, we believe, have already been applied to this purpose in our own country. We are induced to state that an individual of this place has invented an oven which, it is confidently believed, will far exceed the English invention, in reducing the labor of baking: one oven of this construction, we understand, will bake 24 barrels of flour every 24 hours—the entire time commonly occupied in heating and cleaning being saved, by keeping a constant fire *outside*. The same individual has now in operation a machine for forming the dough into biscuit, whereby a saving is secured of at least two-thirds of the labor required by the common method; and the flour intended for our shipping, we are told, may be baked into *thin* or *thick* bread, at a great reduction of expense. Cost of fitting a bakery according to the above plan, it is said, will not exceed $500. The inventor is desirous that the subject may be investigated by scientific and enterprising ship-owners and other citizens, trusting that his demonstrations will be such as to secure for his improvements an ade-

quate degree of encouragement.—[Nantucket Inquirer.]

Stone-Splitting Screws. By Robert Mallet. [From the London Mechanics' Magazine.]

Sir,—Some time since, while visiting the Bangor slate quarries, I was struck with the enormous waste of materials, arising from the mode adopted of shaking down large masses of slate to be afterwards split into roofing slates. The strata lie nearly vertical, and by every blast that is fired many tons of slate are shivered to atoms and made useless.

As a remedy for this, some powerful but simple application of the wedge appeared to me to be worthy of consideration. A conical male screw, working in a split female screw, placed in a jumper hole in the stone to be cleft, appeared one of the best that occurred; and, upon subsequent experiment, I find it to exceed my expectations, both for splitting, roofing, slate-work, and all other stones.

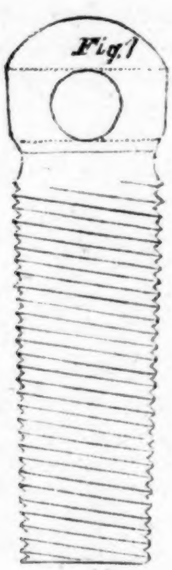
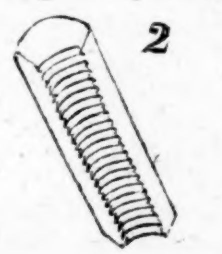


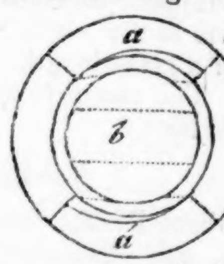
Fig. 1 represents a vertical screw for this purpose, made as an experimental one. It is about nine inches long in the screw, and two inches diameter at the lower end, and two inches and an eighth at the upper. It has a round thread, of as strong a form as possible, and a proper eye at top for the insertion of a lever. The two segments of a cylindrical shell, which form its nut or box, are each one-fourth the circumference of a complete cylinder, and half an inch in thickness; thus the jumper hole for this screw requires to be three inches diameter and nine inches deep.

The screw is made of iron, sheathed with steel like a tap, and hardened; and the box segments are made of cast iron, poured in an iron mould, which makes the screw threads very perfectly and cheaply; their brittleness and hardness are afterwards corrected by annealing. They alone are injured in the operation of splitting, and by this way of making them are easily replaced.

Now, I am fully aware of the objections that may be urged, of a conical screw being applied to a cylindrical one, and of the threads of a conical screw making variable angles with the axis; but the taper or angle of the cone requires to be but very small, being determined by the modulus of elasticity of the stone to be split, which in all rocks commonly met with is very low; so that the screw being very coarse—having round threads, being very little taper, and not requiring to fit accurately—those objections are not cogent.

Fig. 2 represents one of the segments of





the box or nut; and fig. 3 is an end view of the two ($a\,a'$) in their places in the jumper hole; *b*, the screw.

To use this apparatus, the jumper hole being prepared, the two segments are placed at opposite sides of it, and the screw inserted and screwed down. The friction of the stone against the back of the segments keeps them in their respective places. The screw must descend, and as it descends it must expand the segments, and by their expansion the

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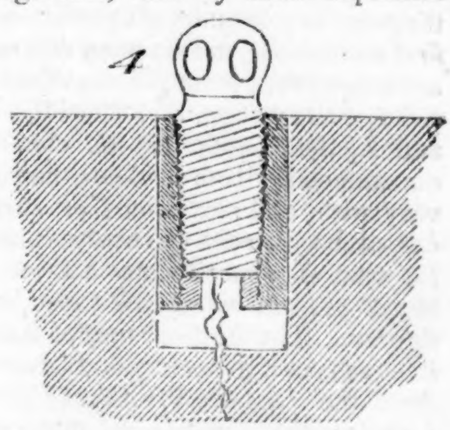

stone is split, (fig. 4.) I have found by experiment that the rock will always split in the direction of the interval between the seg-

ments, as in fig. 5 ; so that when a pro-

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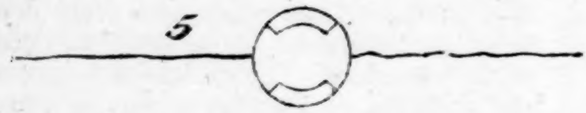

longed section of an homogeneous rock is required, it is easily produced by a number of such screws placed in the desired line, as in fig. 6. Omitting the consideration of the

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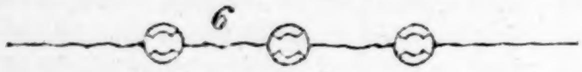


effects of friction, which, I am fully aware, are in this case very considerable, but can only be determined by experiments, it is sufficiently obvious that the power of this instrument is the same as that of a wedge employed for cleaving, whose angle is equal to that of the cone round which the screw is wrapped, urged, or driven on by the energy due to the same screw, actuated by a lever of a given length.

The power of this screw, then, is expressed by

$$P=\frac{h}{2\pi R}W.$$

where P is the power or energy of the screw ; h, the distance between two contiguous threads ; π, the constant ratio of the diameter of a circle to its circumference ; R, the length of the lever used ; and W, the power or dead weight applied.

The power of the wedge, again, is given by the equation,

$$P=\frac{R\,l\,B}{L^2}$$

P representing the energy with which the power of the screw acts against the resistance of the particles of the stone, the length from the point or extremity of the cleft or split when *first commenced*, to that point where the resistance may be supposed concentrated against the sides of the wedge, *i. e.* the screw segments ; and L, the length of the cleft when first commenced. It is obvious, that R, l, and L, vary with different kinds of stone, and are constant with each particular kind ; whence, for want of experimental data, it is impossible at present to reduce these equations to figures. The friction, too, of the instrument increases in a greater ratio than the pressure, from the continually increasing difference between the threads of the conical male screw and those of the cylindrical female screw.

So far, it will be admitted, I have not slurred over the difficulties and disadvantages to which the machine is exposed ; but I have tried it, and the result of one experiment, at which the whole of the Commissioners of Public Works in this county, Mr. Vignoles, the engineer, of Liverpool, and Mr. John M'Mahon, of the firm of Henry Mullens & M'Mahon, were present, and expressed their entire satisfaction, will suffice.

Two men, with a lever of only *three feet in length*, and a single screw and segments of the size before described, split a mass of the argillaceous lime-stone of the county of Dublin, (*Calp* of Kirwan,) weighing nearly a ton, in 17 revolutions of the screw, made in about 25 or 30 sec. The men did not put forth their strength, but merely walked round the stone, which was split contrary to its stratification, and exactly in the line of separation of the segments. The sufficiency of the power is thus clearly shown.

Mr. John M'Mahon has informed me by note, that "he considers it a very great improvement in the art of quarrying."

This instrument is more particularly applicable to slate quarrying, and for the purpose of obtaining great tabular masses of granite, sienite, or other very hard and homogeneous rocks. In the former application, the saving of slate, and of labor in clearing the *face* of slate-rock of the accumulating rubbish shook down by the method of blasting, recommend it. In the latter, the saving of labor, the certainty of the direction of the fracture, and the capability of splitting larger blocks than have been as yet attempted by wedges. It may be also applied to raising stratified rocks from their beds, and as a substitute for blasting in general. The jumper holes usually used for the granite of this county are three inches in diameter, and sometimes *sixteen feet* deep. Each of these screws only requires a jumper hole of nine inches deep, and three inches diameter, and *no gunpowder ;* and it is hardly questionable but that 20 of these screws, requiring *less* labor of preparation, would produce a greater effect than the one blast, besides producing it in a predetermined direction.

There is another advantage of these screws over blasting, that they are free from danger to the workmen employed in using them. There is but one way that I am aware of in which it is possible for them to fail, namely, by the threads of the screw splitting off ; but the force required to strip a steel screw of one-fourth of an inch round thread, in depth and width, when twelve or fourteen threads are engaged at once, is enormous ;

and when a number of screws are in action on one mass of rock, the force on any individual screw need not be great.

The first cost of such screws is not very great. The male or conical screws, being of hardened steel, will last a long time; and the segments are cheaply made, when once the mould is prepared, as they wear out or are broken. The cost of jumpers is less than for blasting purposes, as they are so much shorter. It is obvious, also, that these screws may be applied at the bottom of a fissure or jumper hole, as well as near the surface of the rock, by having the head of the screw properly prolonged.

Oil and black lead should be used to lubricate the screw during its descent. If a cast iron segment should break in the hole during the descent of the screw, it does not matter, as the pieces are still held by friction in their relative situations. The saving in gunpowder and labor alone, in such a place as the Bangor slate quarries, would pay the cost of some thousands of these screws, should they be found to succeed, in a few months I should suppose.

Mechanics in the country too generally do not avail themselves of the great advantages they would derive by cultivating a small spot of ground: where such is done, it adds greatly to their independence, and tends much to increase their domestic comfort. There are many who think it a matter of no importance so long as they can obtain all they wish at the stores, but do not take into consideration the great saving that would be effected by growing their own vegetables, and obtaining milk, butter and cheese, from the produce of their own cow. There are some who think it derogatory to their calling to do so: to them we would recommend a perusal of the following article, taken from the New-York Farmer.

Honorable Nature of Farming. By S. M.
To the Editor of the New-York Farmer.

Sir,—I have been much pleased with your sentiments on the dignity of the Farmer's calling, which you have frequently expressed in your columns, particularly in your editorial introduction, in the first number of the new series of the New-York Farmer. I have three sons, who are of the ages when young men begin to look forward into life, with a view of making choice of a profession. Mine are evidently inclined to almost any pursuit but that of farming, from an impression that it is not as honorable as many others. One wishes to be a doctor; another feels inclined to go to New-York, and become a clerk; and the third thinks the law alone is suitable to his ideas of that consequence and importance to which he hopes to arrive. Now, all this, Mr. Editor, is directly contrary to my wishes. I have a farm of upwards of 500 acres, and am desirous of dividing it into portions for my sons, as soon as they arrive at a suitable age. I could thus, under the ordinary blessings of Providence, make ample and sure provision for them—could have the pleasure in my declining years, of seeing my children comfortably situated, and pursuing a calling that naturally leads to many of those virtues and habits on which much of the happiness of life depends. With all my persuasion, I had not been able to give them any impression of the respectability of an agricultural vocation, until I, the other day, borrowed the numbers of the current volume of your Farmer. These numbers of your paper have accomplished more in the few days they have been in my house, than I have done by all my persuasion for years. I send you three dollars for the work, from the beginning of this year, and if it should be the means of causing my sons to look upon farming as one of the most useful and respectable pursuits in which intelligent and well educated youth can be engaged, I shall think you are entitled to half of my farm. Yours, &c. S. M.

Newark, N. J. May, 1833.

Remarks.—We hope S. M. will not forget us in his "last will and testament." We would be willing, however, to take up with one fifth of his farm deeded to us now, and will, on our part, guarantee that his sons will, if the New-York Farmer is thoroughly read by them, soon be brought to look upon farming as the most learned and honorable of human callings. While we are on this subject, we would direct the attention of our correspondent to the following extract from an Address delivered by the Rev. Gardner Perry, before the Essex County Agricultural Society, (Mass.) at the annual Cattle Show, in 1832:

"Another hindrance in the way of agricultural improvement is an impression entertained by many that farming is not so genteel and honorable as some other employment. How this feeling grew up, (a feeling in the extent to which it exists among us almost peculiar to New-England,) I shall not attempt to decide; sure I am of its existence and of its baneful influence, though, like the

one just before mentioned, operating with somewhat diminished force. It has dried up the spirit and held the mind of many a noble and virtuous youth in bondage, suffused many innocent cheeks with a blush, prevented many ingenious and stirring spirits from going into that employment, whose taste and interest would otherwise lead them to it, and induced those who were engaged in it to work with less vigor, to seek for improvement with less interest, and frequently to turn all their originating and inventive powers into other channels, even when farming was still their real occupation.

"Who can look for a moment to the nature and operations of this society and the men who compose it, and not perceive how powerfully its influence must tend to remove an impression so unfounded in principle, so hurtful in its tendency. The example of the rich, the learned and distinguished men who give life and interest to this Society, comes in upon the soul of many a laboring youth like a refreshing and gladdening shower upon the thirsty land and withering herb.

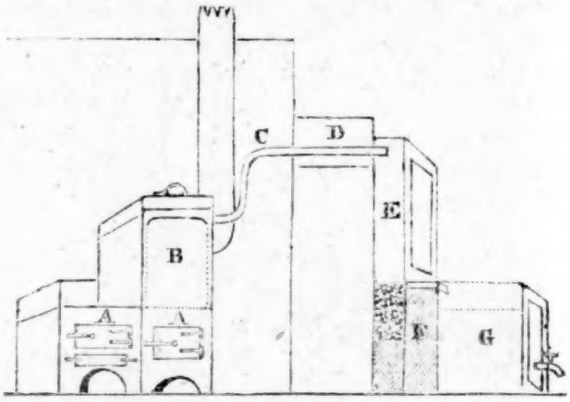
"The story that Pickering, the founder, and for many years the worthy and efficient President of this Society, held the plough, handled the spade, and looked well to the stall, has a thousand times been told, and wheaever told has poured fresh courage and joy into the mind of many a toiling youth, who, humbled under the impression of which I am speaking, was tempted to blame his fate, which, in his apprehension, had cruelly chained him to a farmer's life.

"Another obstacle in the way of agricultural improvement, is a too general impression entertained that learning is of *little* advantage in the business of a farmer's life. Were it not for observations on other subjects, which I wish for special reasons to make, I should like to dwell a little on this point. As it is, I must content myself by observing, that in my apprehension there is no other employment in which there is a constant demand for manual labor, where there is so loud a call for the aids of science, or where the suggestions of a well instructed mind would prove a more efficient help. For proof of the correctness of this opinion, I have no occasion to go beyond the limits of this county, or out of the catalogue of the members of this society. Were I to train a child for the labors of the field, my first care would be to make him familiar, not perhaps with either ancient or modern languages, though if possessed of common sense they would do him no hurt, yet with the physical sciences: in all which I would have him as carefully instructed as if he were to go into professional life. Knowledge is power, power in the field as well as in the senate-house, power over matter as well as over mind."

Apparatus for freshening Salt Water. By E. W. B. [From the London Mechanics' Magazine.]

Dear Sir—I beg to submit for insertion in your truly valuable Magazine, the design of an apparatus intended to remedy the dreadful consequences arising from want of fresh water on board of ships. The apparatus by which this immense advantage may be obtained is so simple, and will occupy so little room, that there is no vessel which might not readily avail itself of it.

It is well known that the steam arising from salt water is perfectly fresh. If, therefore, this steam were conveyed, by means of a pipe attached to the copper, through a trough of cold water, which would act as a condenser, and if the water thus obtained were then passed through a filterer, it would be furnished for use not only in a fresh but in a very pure state. In the accompanying sketch, A A represents the stove (one of Frazer's pa-



tent sort); B, the copper; C, the steam pipe; D, the cold water condensing trough; E, a well for the reception of the water to be purified, which is half filled with sand, and coarse gravel on the top of it, and communicates at the bottom with another well, F, only half the height of the former, and which is also to be filled, excepting two or three inches, with coarse sand. The water, after filtering downwards through the first well, ascends through and accumulates on the top of the sand in the second, whence it passes over into the reservoir, G.

If, from frequent use, the apparatus should get in the least clogged, it may be cleansed in a few minutes, with the utmost facility, by

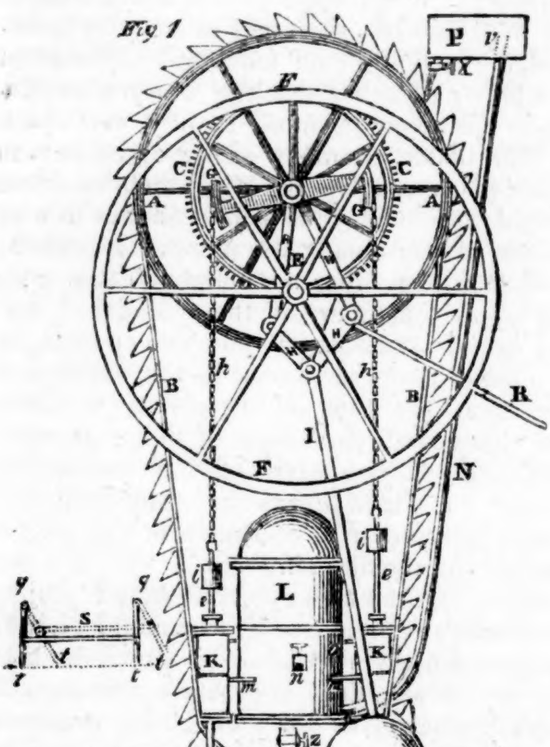
merely washing the sand and gravel, and thoroughly rinsing the pipes.

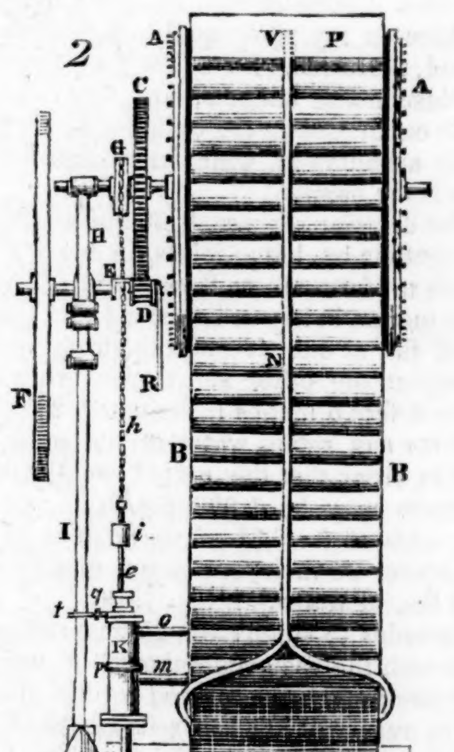
Much, of course, will depend on the size and purity of the sand, which will not always afford the same results. I have found that a prolongation of the stratum of sand does not much impede the produce of the filterer, but materially contributes to the purity of the water, which, it is not exaggeration to say, may be had by this means equal to the best spring water.

[In another number of the Mechanics' Magazine, we find the following, in relation to the preceding invention :]

Salt Water Freshening Apparatus.—Dear Sir : Since I forwarded the sketch of the apparatus for freshening salt water, which you was kind enough to insert in your last number, I have found that the pipe for the steam must be in the shape of a syphon, and not as shewn in your engraving ; for I find that the motion of the ship, when there is the least wind, would otherwise send the water back into the boilers. There ought also to be a cock inserted in that part of the pipe which is close to the boiler, so that the steam might be turned off when required ; for in Fraser's patent stoves most of the vegetables are cooked by steam. There might also be a pipe led from the condenser to the boiler, so that when the water becomes warm from the action of the steam in the pipe, it could be discharged into the boiler. I remain, dear sir, your obedient servant,

Edw. Whitley Baker, jun.





Pierre Nicholas Hainsselin's Machine or Motive Power for giving Motion to Machinery of different descriptions, to be called "Hainsselin's Motive Power." [From the Repertory of Arts, &c. for March.]

No. 1 represents a front view of the machine, and No. 2 a side view ; similar letters of reference are used to denote similar parts in each view. A A is a large drum ; B B, an endless series of reservoirs, or (as they would be called on a water-wheel) buckets, each fastened by a hinge joint to the other, so as to form an endless chain passing over the drum ; C C is a cogged wheel, working into the pinion D, and E is an eccentric, more particularly explained hereafter ; F F is a fly-wheel ; G G is a balance beam, carrying the segment of a circle at each end ; H H H H is what I call an escapement for I, which is a pendulum, and I 2 is the weight of the pendulum ; K K are two pumps ; L is the main cylinder of the machine ; M, an air pump ; N, a pipe

through which the water which works the engine is raised; O is a reservoir to receive the water from the descending buckets, and P a reservoir to receive the water from the pipe N.

When it is required to make one of the said machines, the following details must be observed: Suppose, for instance, it is required to make one on my plan, equal in power to a steam engine of which the expansive force is equal to a resistance of 1,000 lbs. in a second. It will be seen that air and water are the two principal agents in my machine. Water, it is known, weighs from 60 to 62 lbs. the cubic foot, and it requires 32 cubic feet of air to balance one cubic foot of water; and I have found by various experiments, that my machine employs about three-fourths of its power to produce its own action. From these premises it results, that, in order to have a machine on my plan equal to 1,000 lbs. per second, there must be 4,000 lbs. of water in the descending buckets, and 200 cubic feet of air condensed in the cylinder L, by means of the air pump M, which is worked by hand by a lever handle.

The drawing represents 64 buckets, fastened together by hinge-joints, in such a manner as to form an endless chain of buckets, their motion being so contrived that they descend full at one side of the drum, and rise empty at the other side; the drum being about 3 feet 6 inches in diameter, 25 of these buckets can retain water at the same time, and in order that the united weight of their contents may be 4,000 lbs. it is necessary that each of the 64 buckets shall be of a size (whatever be their form) conveniently to hold 160 lbs. of water.

In order to supply the 25 descending buckets with the required quantity of water, the two pumps K K are placed a little above the lower reservoir O; the rods of these pumps plumb with the extremities of the balance beam G G, by which they are worked.

The capacity of each of these pumps should be such, that each stroke of the piston should raise a column of water to the upper reservoir P, sufficient for the supply of one bucket, that is to say, 100 lbs. These pumps, which may be called hydropneumatic, are nearly like ordinary lift-pumps, the only difference being that the pump chamber is divided into two parts by the division *p*, the upper part being furnished with the piston of a force pump; the same rod, *e*, works both the piston of the upper part of the pump chamber, and the valve of the lower part of the chamber. The pump rods *e e* are fixed to a chain *h h*, which is attached to the segments on the ends of the balance beam G G, and thereby made to work the pump rods, while the balance weights *i i*, below the extremities of these chains, keep them at a proper degree of tension, and keep the beam on a just balance. The strong cast iron cylinder L must be capable of resisting the force of the condensed air which it is intended to contain, say at least 240 lbs. The interior of this cylinder is furnished with a division, by which an upper and lower chamber is formed, the lower is intended to receive the water which the pumps K K feed it with, by means of the pipes *m m*, at every stroke of their pistons; and in this chamber the water frees itself from the air which may have been pumped in with it, and which is suffered from time to time to escape at the cock *n*, when a quantity has collected sufficient in any way to retard the action of the machine. It is from this lower chamber that the water is supplied to the upper reservoir P.

The upper chamber of the cylinder L is destined to receive the air which is to be forced into, and thus condensed in it, by means of the small air pump. It will be seen that two pipes *o o* communicated with the upper chamber of the cylinder L and the upper chamber of the two pumps K K: these pipes are to let in the condensed air upon the tops of the piston, to cause the downward movement of their alternate action; *q q* are two valves, each furnished with a lever *t t*, which levers are connected by a pointed cross-bar S, as shown in plan in the margin of the drawing No. 1. As the two arms or levers *t t* of this contrivance project beyond the vertical line of the pendulum I, they are acted upon alternately by the vibration of the pendulum, thus alternately opening and shutting the valves *qq*. The lower reservoir O may be of any convenient capacity, but the upper reservoir P should at least be able to contain as much water as 25 of the buckets can hold, and the ascending pipe N, through which the water is raised from the lower chamber of the cylinder L, to the upper reservoir P, should be of such a diameter as to contain exactly the quantity of water required to fill three of the buckets.

The cock X is to regulate the descent of the water from the reservoir P into the buckets, which should be just equal to what is pumped up by each pump at each stroke of the piston. An air cock is attached to the top of the upper chamber of the cylinder L, and is to let a portion of the condensed air es-

cape when its too great density causes the engine to work at too rapid a rate.

Z is a cock for emptying the lower chamber of the cylinder L, when necessary for repairs or otherwise, and a similar cock or valve should be made to the lower reservoir O, in case, at any time, it should be required to empty it.

As it is necessary that each bucket as it empties itself should be replaced by a full one, the pinion D should be so regulated with reference to the toothed wheel *c* (which is fixed on the same axis as the drum A) that at every half revolution of the fly-wheel F, (which gears in with the pinion D, and is on the same axis with the eccentric E,) one of the buckets shall present itself in turn under the cock X to be filled.

The pendulum I is fixed on the same axis as the balance beam G G, and the object of the eccentric fixed on the axis of the fly-wheel is to act upon that part of the pendulum which I call the escapement, at *r*, thus propelling the pendulum to one side, while, as soon as the eccentric turns away from *r*, and it thus escapes from the action of the eccentric for a time, its own weight brings it back to be acted upon by the eccentric again, thus keeping up the vibration of the pendulum. The jointed bars at H H H H, which I have called the escapement, form a part of the rod I. This rod is furnished with the weight I 2, which may be raised or lowered on the rod I, by turning it to the right or reft on the thread of the screw Q, to regulate the motion of the pendulum, and this motion may be further regulated by the segment bar and adjusting screw K, which expands or contracts the jointed bars H H H H of the escapement at pleasure, and thus allows an increased or diminished action of the eccentric on the part *r* of the escapement.

R is a lever to throw the pinion D in and out of gear with the fly-wheel F, in order to stop the machine, or put it in action when required, and it may be well here to describe that this is effected by means of a small arm, which, when in gear, protrudes through a hole in the flange; O O of the pinion is drawn away from this arm, the fly-wheel and all upon its axis stops, and the pinion turns harmlessly with the toothed wheel.

Having now described the various parts of my said invention, and their several uses, I will proceed to describe the mode of putting the machine in operation. First, put a sufficient quantity of water in the reservoir P to fill 25 of the buckets, and about the same quantity in the reservoir O; then open the cock, X, of the upper reservoir, and by means of the lever R, throw the fly-wheel out of gear with the pinion D. By continuing to press lightly on this lever, R, it will cause the flange, *o o*, to rub against the wheel *c*, which it must, by means of the friction thus caused, be allowed to turn slowly, so as to give time to the 25 buckets to fill themselves. The moment the whole of the 25 buckets are full, the pinion must be smartly thrown into gear with the fly-wheel F, and by means of the lever *a* of the air pump M, the upper chamber of the cylinder L must be charged with air. It will be known when it is full by the sudden resistance the air will make when that is the case. The two foregoing operations will only be necessary when the machine is put in motion for the first time, or when afterwards, for any purpose, it may have been emptied of its air and water.

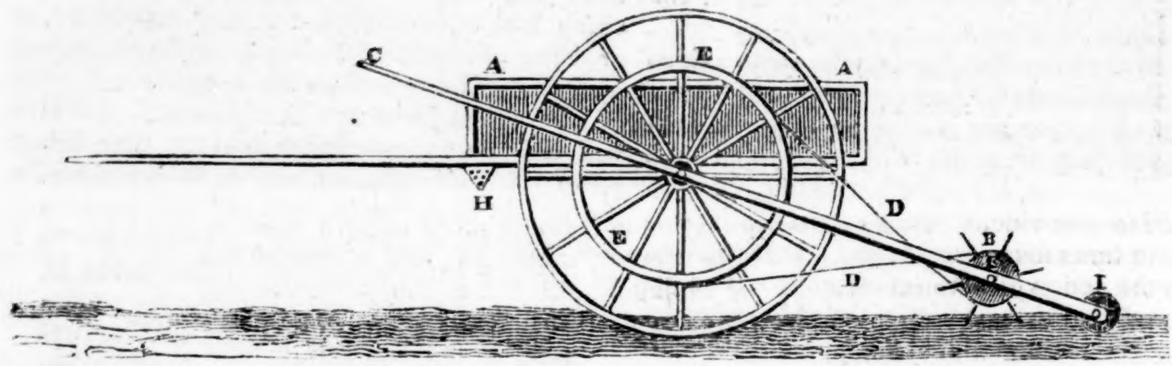
The machine is now ready to act, and it will only be necessary to give the first impulse to the pendulum, which, being done, the weight of the water in the 25 full buckets will cause the drum to rotate, as also the toothed wheel *c*; this will act upon the pinion D, which it worked into, and will cause the eccentric E, and the fly-wheel F, which are fixed upon the same axis, to revolve, the fly-wheel being so arranged as to make just half a revolution during each vibration of the pendulum.

The eccentric E, which is fixed upon the axis as the fly-wheel, will always act upon the pendulum, and secure to it its vibrating motion while the length of the strike will be easily determined by opening or shutting the escapement H, which is performed by turning the screw either to the right or left, as the case may be.

By raising or lowering the weight, I, 2, so as to make the vibration of the pendulum correspond with the speed of the fly-wheel. This weight, I, 2, should be of such a weight that when vibrating by its own weight, only, it will have the power to give full three strokes to the pumps K K. This pendulum, which is fixed on the same axis as the balance beam G G, will give an alternate movement up and down to each arm and segment of the beam, and these segments being connected with the rods *e e*, of the pumps K K, by means of the chains *h h*, their motion will work the pumps, and raise the water from the lower reservoir O to the upper P, through the lower chamber, of the cylinder L, and the ascending pipe N, whence it will flow again through the cock X, to fill in succession the 64 buckets of the machine.

The pendulum I, in its passage from * to *, strikes alternately the arms of the lever *t t*, which opens and shuts the valves *q q*, in order alternately to let escape and confine the air in the upper chamber of the cylinder L. The portion of the air which the alternate motion of the valves *q q* allows to pass into the upper chamber of the pumps K K expands, and acting with all its force on the upper side of the piston *d*, forces it down to the small openings *p p*, cut in the chamber for that purpose, and, escaping there, relieves the piston of the pressure, while the balance weights, *i i*, keep the chain, *h h*, stretched out, and the balance beam G G in equilibrio.—In order to preserve the density of the air in the upper chamber of the cylinder L, the operator must occasionally pump the chamber full of air, by means of the pump M; if this be done every five or six minutes, it will prevent the necessity of spending two hours when the machine first starts to charge the chamber.

Now, whereas it is evident that the power of the machine hereinbefore described may be applied to any of the ordinary purposes for which the power of steam-engines are now used, I claim it as my invention, &c., &c.



Machine for Harrowing, Sowing, and Rolling. By James D. Woodside. To the Editor of the New-York Farmer, and American Gardener's Magazine.

Sir,—I have recently invented and tested what judges esteem a valuable improvement in the harrow. It consists of a revolving cylinder, containing 45 feet, which is revolved by a power obtained from the wheels of a cart, to which it is with ease attached and detached. In addition to the harrow, there is a convenience for sowing the grain in front of the cart, by supplying a hopper, from which it is conveyed into a sieve, so constructed as to distribute it from wheel to wheel. The cylinder harrow in the rear of the cart effectually covers the grain. Attached to this is another cylinder used as a roller. From the above it will be perceived that I can of a truth affirm, that I can sit in the front of my cart, under a canvas covering, sow the grain, harrow and roll it in, without exposure to the sun, leaving the ground without any impression of the horses' feet, my own feet, or the cart wheels.

You will perceive by the crossing of the band, that the cylinder has a counter motion to that of the cart wheels, making 12 revolutions while the wheels of the cart make one.

References.—AA, the cart; B, cylinder; C, shaft on one side, with a power to elevate or depress the cylinder; D D, chain-band; E E, the V groove-wheel; F, do. do. on the end of the cylinder; H, the end of the sieve; I, the roller. The hopper is inside the front of the cart, and not seen.

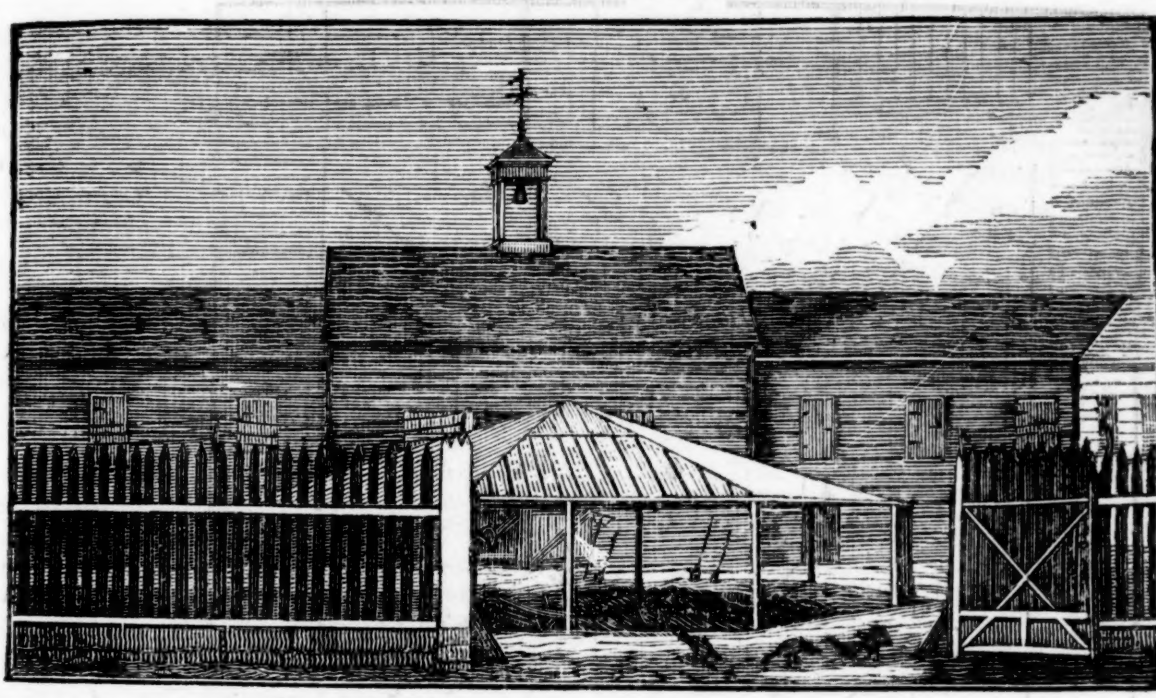
Highly competent judges have approved of the machine, and I think the advantages great. I am advised by Mr. Van Kleek, of your State, who has witnessed its operations, to exhibit it at Albany, before Mr. Van Rensselaer, and other patrons of agriculture in that vicinity. This I shall do as soon as I conveniently can.

It is my determination to dispose of only a half or fourth of a right to a state, until it shall recommend itself to the public. Although the invention has been patented by me nearly a year, yet I have not heretofore brought it into any notice, having been determined to perfect it as far as possible before exhibiting it.

Your very obedient servant,
James D. Woodside.

Washington City, D. C., May 9, 1833.

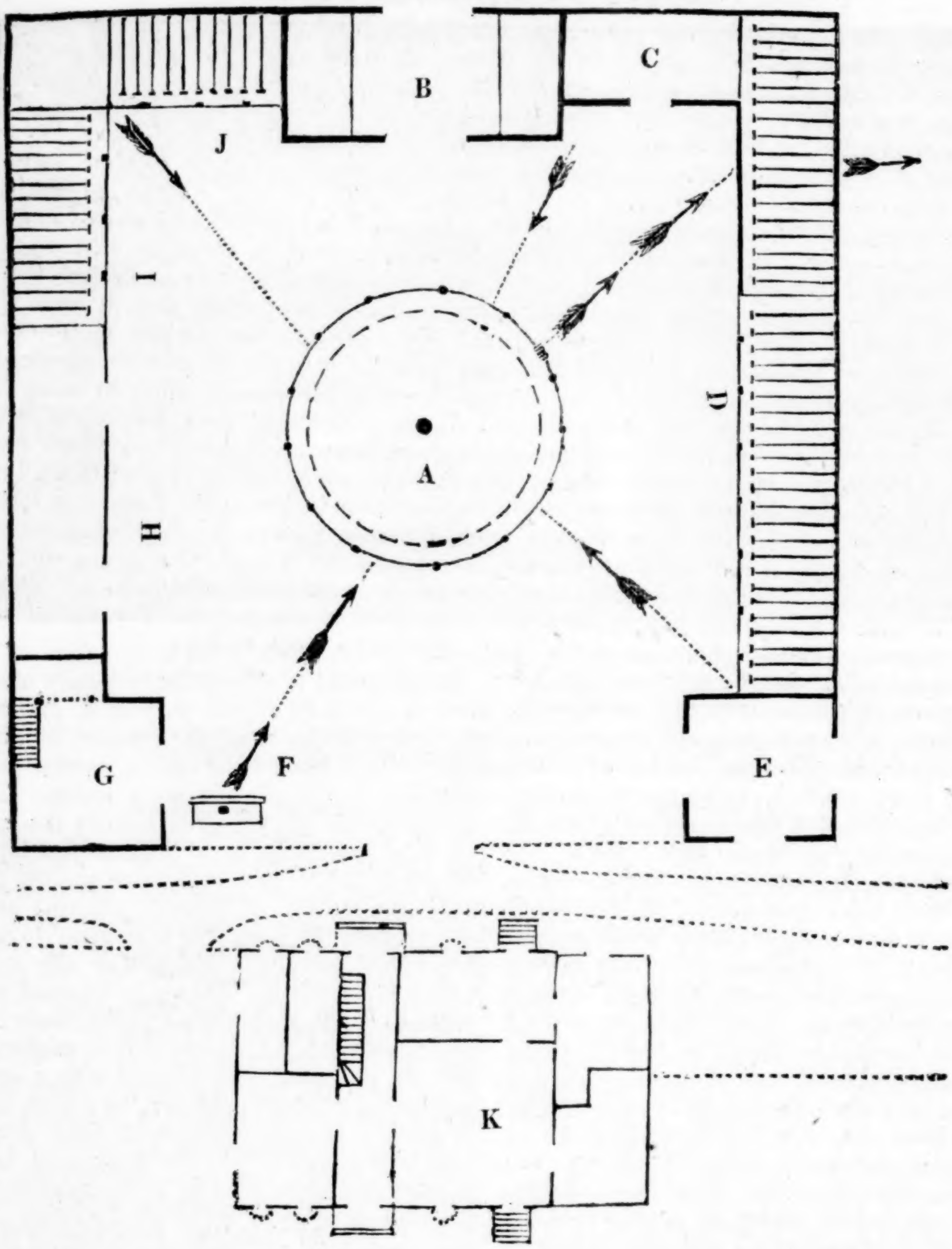
Remarks.—We think very favorably of the above, and hope farmers will show a prompt disposition to favor the inventor, who, we understand, devised the plan and superintended the work of placing the colossal statue of Washington on the summit of the Monument in Baltimore.—[Ed.]



Description of an Improved Stercorary—communicated in a Letter to Dr. James Mease, of the Agricultural Society of Philadelphia, by DAVID HOSACK, M. D. [For the Mechanics' Magazine.]

NEW-YORK, May 1, 1833.

DEAR SIR,—When you did me the favor of a visit at Hyde Park, during the last summer, you expressed a wish to receive from me a sketch and description of the shed or stercorary I have erected in my barn-yard for the purpose of preserving and improving the qualities of manure. Having many years since, when Professor of Botany in Columbia College, taught the principles of vegetation and agriculture as connected with that department of science, and discoursed upon the food of plants, the nature and qualities of soils and manures, you will readily believe that upon removing into the country and engaging in the practical duties of farming, my attention would be primarily directed to accumulate, preserve, and improve the contents of the barn-yard, as constituting the essence, or, as it may be called, the *vital principles* of successful agriculture. For this purpose, while my neighbors are in the habit of exposing their manure to the air and the sun, or accumulating it in cellars, I was induced to erect the shed, or umbrella, exhibited in the annexed plate. I should premise that the barn and other buildings surrounding the barn-yard occupy three sides of a hollow square, each side being 175 feet in extent. The stercorary is placed in the centre of the barn-yard, and is covered by a shed in the form of an umbrella; this is erected immediately above the manure heap, for the purpose of preventing the evaporation of the manure in summer, at the same time that it serves as a shelter for the cattle during a storm. The shed is about *forty feet* diameter; the centre post sustaining it is *thirteen feet* high; the posts in the circumference are *ten feet* in height and *ten* in number, allowing sufficient space for a cart or a waggon to pass between them for the deposite or the removal of the manure; the top is covered with common unplaned boards, and the whole roof is washed or painted over with a mixture of tar, oil, and sand, and colored with a small proportion of Spanish brown, by which composition it is partly preserved from decay. You will recollect that the barn-yard is so formed that the centre of it is excavated in the form of a dish, while all the other adjacent parts of it are gradually inclined to the centre, gravelled and rolled, so that every portion of the yard is preserved dry, hard, and clean. Small paved drains for conveying the *stale* from the cattle sheds and stables, communicate with the centre. In case of rain, the water from the adjoining buildings also flows to the reservoir, and when the dish or excavation may overflow, a covered stone drain, with an iron grating at its mouth, conveys the surplus liquid parts of the manure to a large tank, or cistern, holding about 60 hogsheads, situated in the garden, from whence it is raised by a pump at the pleasure of the gardener, who finds in



this a valuable and rich resource for his vegetables. By this contrivance no part of the manure of the yard is lost. The above mentioned shed, by placing a frame work like the small braces of an umbrella at the upper part of it, is also devoted to the purposes of a roost for poultry; this, too, at the same time that it affords an ample and warm protection for fowls, in some degree attracts them to that part of the barn-yard, and thereby preserves the remainder of it relatively clean, for it is to be recollected that they spend a great portion of the day upon the manure heap, as well as lodging above it during the night. They are also regularly fed in the barn-yard, which attaches them to it, and prevents them from wandering far from their home. The fowls also have access to the cattle sheds, and to the sheep cellar beneath the barn, where they make their nests; by this arrangement, while the family is most abundantly supplied with the produce of the poultry yard, the fowls are protected from their natural enemies.

References.—A, the stercorary; B, the barn; C, straw house; D, cattle and horse

stables, with sheep cellar beneath; E, waggon-house; F, well and trough, for watering the cattle; G, cider mill, with the cider press adjoining, next to H; H, apartment for sheep shearing, with cider cellar beneath; I J, cow stalls, with a root cellar situated in the centre; K, farm-house and dairy beneath.

If this communication should contain any hints that may prove beneficial, I will be gratified in complying with your request.

Origin of the Corinthian Order of Architecture. By F. To the Editor of the Mechanics' Magazine.

Sir,—In the remarks upon the Corinthian Order of Architecture, contained in the extract from Partington, in a recent number of the Mechanics' Magazine, I perceive that the origin of it is attributed to the Greeks. The authority for this is derived from Vitruvius, whose account of the discovery is as follows: A marriageable young lady of Corinth sickened and died. Her nurse, entertaining a very great affection for her, placed sundry ornaments with which she used to be pleased in a basket near her tomb, and covered the same with a tile. The next spring, an Acanthus, or Bear's-breach, sprang up around the basket, the leaves of which, on meeting with the tile, curved downwards like volutes, and the sculptor Callimachus accidentally observing it, drew from thence the first idea of the Corinthian Order. Although the story is well told, and at first sight may seem quite plausible, yet it exhibits so many incidents of a peculiarly interesting character in so close a connection, such as the youth and marriageable age of the lady, affection of the nurse, &c. as to lead to the belief that, if it be true in the main, it must have received considerable embellishment. That the order may have been improved by some such circumstance as related above, is perhaps not improbable, but that it originated with the Greeks cannot be well credited, for we find that the Egyptians long before "formed the caps or upper part of their columns into elegant vase shapes, decorated with the stalks, leaves, buds, and blossoms, of the lotus or lily of the Nile, and occasionally the leaves of the palm, vine, papyrus, and date, were introduced." (See Civil Architecture, Ed. Encyclopædia, p. 424, and likewise plate C L of the same work, where are representations of several Egyptian Capitals, having a remarkable striking resemblance to the Corinthian.) In the article above referred to, we are cautioned "not to overlook, in the warmth of our devotion for the inspiration of Grecian genius, the facts, that in the pillars of several of the temples in upper Egypt, whose shafts represented bundles of reeds or lotus bound together in several places by fillets, the capitals are formed by several rows of delicate leaves. In the splendid ruins of Vellore, in Hindostan, the capitals are also composed of similar ornaments; and it is likewise well known that the Persians at their great festivals were in the habit of decorating with flowers the tops of the pillars which formed their public apartments. It is therefore not improbable that these circumstances, after so much intercourse with those countries, might have suggested ideas to Callimachus, which enabled him to surpass the capital of Ionia." It is farther added, that "the Egyptians introduced human figures in place of columns. The Greeks did the same, claiming the invention and naming them Caryatides." There can be little doubt that the Termini of the Romans had a similar origin.

They are not inaptly compared to the "figure of a man stuck into a sheath," and are merely imitations of mummies, which occur frequently in the architecture of the Catacombs. F.

New Fire—Mr. J. Hancock, of Fulham, has, we are assured, invented a compound which burns under water, and which continues inflammable in any accumulation of moisture. It is in all respects similar to the much celebrated *Greek Fire.* He proposes to apply it not to human destruction, but to the saving of the lives of miners. It is the most perfect and unerring fuse for blasting ever contrived; the wet damp, and water, which often interfere, being no hindrance to its perfect and definite action. It may, too, be accommodated to time, as a yard will burn out in one or two minutes, or in five or six minutes as desired. It is moreover as cheap as any fuse that ever was made.—[London Lit. Gazette, Ap. 6.]

Society of Mechanics to improve Architecture.—An association of mechanics has been formed at New-Haven to improve the style and taste in architectural structures. The objects coming within the purview of the society are numerous, not only the style of dwellings, but of all the out-buildings, their adaptation for the comfort and convenience of man and beast, the economy and durability of the materials, and the best means of ventilating and warming the apart-

ments, are among the subjects embraced. Such an association should exist in every considerable village, as well as larger town and city. Agricultural and Horticultural Associations should give at least some attention to this subject, and have a division of the members devoted to it.—[N. Y. Farmer.]

"Pray, Mr. Abernethy, what is a cure for the gout?" was the question of an indolent and luxurious citizen. "Live upon sixpence a day—and earn it;" was the pithy answer. —[Annual Biography and Obituary for 1832.]

Monthly Analysis of Scientific Periodicals for April.

The London Mechanics' Magazine contains a great quantity of useful matter. Among the best is a review of

"Dr. Lardner's Book on Heat"—to the merits of which the Editor has done ample justice, as does his correspondent, Mr. J. O. N. Rutter: the latter states, "It is an elegantly written work, and no trifling praise for it is to say that it deserves a place on the same shelf with Herschel's Introduction to the Study of Natural Philosophy."

"Henneky's Guage for Standing Casks," (with cuts,) copied from the Transactions of the Society of Arts, we shall take the liberty of transferring to our columns next month.

The Review of the "Penny Cyclopædia" of the Society of Useful Knowledge is written in the Editor's happiest manner. The Society certainly deserve great censure for issuing under their sanction a work with so many palpable errors—errors that would disgrace the merest tyro in literature.

"Lawton's Safety Lock."—Judging from the description and plates, we should think this the best ever invented. The inventor has offered £110 to any one who can pick it with false keys. Very many have been the attempts in England to produce a Safety Lock; Mr. Chubbs approached nearer to perfection than any, but (if we remember rightly) an old house-breaker, in confinement at the Hulks at Sheerness, succeeded in opening it by skeleton keys, in the presence of the inventor and other persons interested.

Upon the whole, we think greater than usual care has been taken to make this month's number interesting and useful; the wood cuts are well executed, and the printers (Messrs. Cunningham & Salmon) deserve every commendation for the workmanlike manner in which they have issued it from the press.

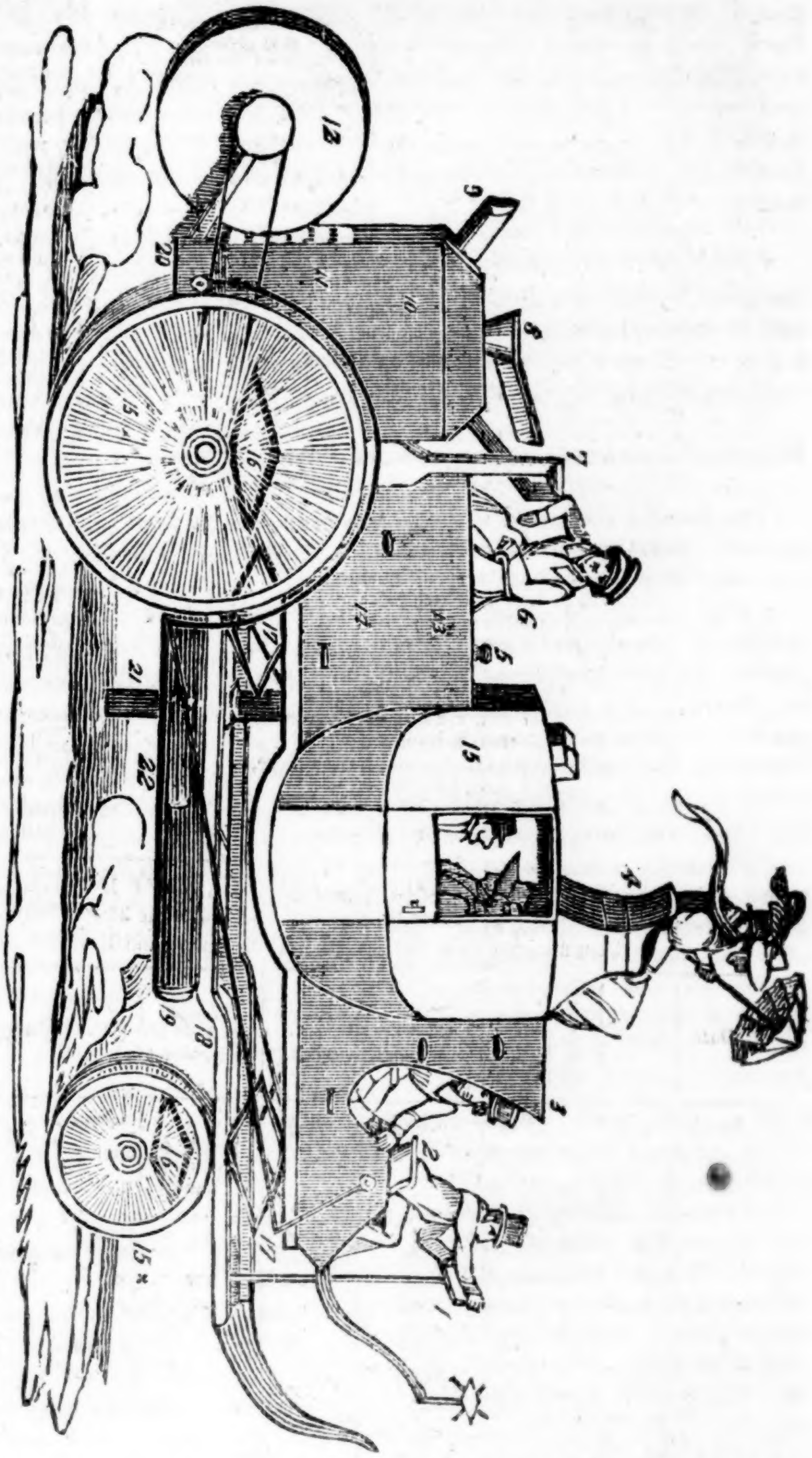
In our last we alluded to the Editor's review of Mr. Gordon's Locomotive Journal, (p. 213)—where, speaking of Steam Travelling on Common Roads," he says "*The thing on a common road is impossible, nature and art alike forbid it.*" Mr. Ogle has replied in a very sensible, and in our minds conclusive manner, to the above assertion: from the following extracts from his evidence before the House of Commons, it appears that "the travelling by steam on common roads at the rate of 20 miles an hour is not 'impossible,' and 'the thing' is not 'forbid by nature and art.'" Mr. Ogle states that "his steam carriage went from the turnpike gate at Southampton to the four-mile stone on the London road, *a continued elevation*, with one *very slight descent*, at the rate of 24½ miles an hour, loaded with people." Mr. O. further states that he has done so several times on that and on *other* lines of road *more trying*. He also mentions the names of several distinguished scientific individuals, who accompanied him, and timed the rate of going: on one occasion he accomplished three and a half miles in five minutes and a half. Mr. O. concludes his letter thus, "After some experience, I venture to affirm that *twenty* miles an hour are to be cleared between London and Edinburgh."

We should infer that he (the Editor) meant it was impossible to travel on a common road by steam power, at all; however, he now admits the possibility of travelling from 10 to 13 miles an hour in that manner. We cannot divine why a steam drag should not convey passengers 20 miles an hour; it is quite evident from the testimony of Mr. Ogle, and his partner, Mr. Summers, and corroborated by Mr. Gurney, that it has been accomplished, and we see nothing that would induce us to think with the Editor of the London Mechanics' Magazine, that the project is "conceived in an *ignorant* and visionary spirit."

The Editor, in reply to a very sensible communication on the same subject, signed "Animo," comments pretty freely on Mr. Ogle's testimony, occasionally with more warmth and less courtesy than is generally used on such occasions. Both Mr. Gurney and Mr. Gordon, are, we know, good practical judges of such matters, and in their hands we leave it, trusting that they will favor us with ample testimony of the practicability or inutility of the attempt; at present, we would say to the Editor of the "London Mechanics' Magazine," in the words of his own correspondent, Animo, "If the thing be fudge, and you have it in your power to prove it to be such, pray do not trifle with us by

mere oracular assertions—prove it."

The annexed drawing, copied from "Bell's Weekly Messenger," is, we are informed, a correct representation of Messrs. Ogle and Summers' steam carriage, alluded to by Mr. Ogle in his evidence before the committee of the House of Commons, in which they travelled from Southampton to Liverpool, *via* Oxford and Birmingham, a distance of 200 miles, as they performed it.



References—1. Helm by which the carriage is guided; 2. Seat for the conductor; 3. Coupe, like French Diligences, for four persons; 4. Seat for outside passengers; 5. Hand-pump for filling tanks; 6. Seat for engineer; 7. Pipe for surplus steam; 8. Jigger by which the furnace is fed; 9. Flue, or chimney; 10. Boiler; 11. Furnace; 12. A Blower, worked by a strap round the axle; 13. Water Tank; 14. Break to check speed, regulated by a lever to the conductor' seat; 15. Carriage for eight inside; 15*. Wheels, very strong, the spokes not here marked; 16. Springs on which the machinery rides; 17. Springs on which the carriage rests; 18. Frame connecting the whole; 19. Machinery, under the carriage; 20. Ash Box, under the furnace; 21. Pump by which the engine forces the water into the tanks; 22. Piston for working the pump.

The Franklin Journal contains a complete refutation of the claims set up by Professor Daniels, alluded to in our last, for inventing the Oxy-hydrogen Jet, it is made quite clear that its original invention was Dr. Hare, and the description of it appeared in print in Tilloch's Philosophical Magazine, so long ago as the year 1802. Among the patents there is nothing very material. There is an interesting beginning article on the Art of Glass Blowing, translated from the "Journal des Connaissances Usuelles;" and several minor articles selected from other scientific journals.

The Repertory of Inventions has nothing of much interest this month, excepting an account of a patent granted to Mr. W. Joyce, of Bow, near London, for an improvement in making collars for horses, thereby preventing the mischievous effects caused by the galling their necks, owing to the unequal bearing of the ordinary collars.

[This celebrated song is printed in several collections of Poems published in the sixteenth century. There are many variations in each of the copies. The following version is that given by Ritson, in his "English Songs," with the exception of the last stanza, which is from a MS. in the Bodleian Library at Oxford. In that manuscript the Poem is ascribed to Sir Edward Dyer, a friend of Sir Philip Sydney.]

My mind to me a kingdom is;
  Such perfect joy therein I find,
As far exceeds all earthly bliss,
  That God or Nature hath assign'd;
Though much I want that most would have,
Yet still my mind forbids to crave.

Content I live, this is my stay;
  I seek no more than may suffice;
I press to bear no haughty sway;
  Look what I lack, my mind supplies;
Lo! thus I triumph like a king,
Content with that my mind doth bring.

I see how plenty surfeits oft,
  And hasty climbers soonest fall;
I see that such as sit aloft
  Mishap doth threaten most of all:
These get with toil, and keep with fear;
Such cares my mind could never bear.

No princely pomp nor wealthy store,
  No force to win a victory;
No wily wit to salve a sore,
  No shape to win a lover's eye;
To none of these I yield as thrall;
For why? my mind despiseth all.

Some have too much, yet still they crave,
  I little have, yet seek no more;
They are but poor, though much they have,
  And I am rich with little store.
They poor, I rich; they beg, I give;
They lack, I lend; they pine, I live.

I laugh not at another's loss,
  I grudge not at another's gain;
No worldly wave my mind can toss,
  I brook that is another's bane:
I fear no foe, nor fawn on friend—
  I loath not life, nor dread mine end.'

My wealth is health and perfect ease,
  My conscience clear my chief defence;
I never seek by bribes to please,
  Nor by desert to give offence.
Thus do I live, thus will I die—
Would all do so as well as I.

I joy not in no earthly bliss,
  I weigh not Crœsus' wealth a straw;
For care, I care not what it is—
  I fear not fortune's fatal law:
My mind is such as may not move
For beauty bright, or force of love.

I wish but what I have at will,
  I wander not to seek for more;
I like the plain, I climb no hill;
  In greatest storms I sit on shore,
And laugh at them that toil in vain
To get what must be lost again.

I kiss not where I wish to kill,
  I feign not love where most I hate;
I break no sleep to win my will,
  I wait not at the mighty's gate;
I scorn no poor, I fear no rich—
I feel no want, nor have too much.

Some weigh their pleasures by their lust,
  Their wisdom by their rage of will;
Their treasure is their only trust,
  A cloaked craft their store of skill;'
But all the pleasure that I find,
Is to maintain a quiet mind.

METEOROLOGICAL RECORD, KEPT IN THE CITY OF NEW-YORK,

From the 30th day of April to the 31st of May, 1833, inclusive.

[Communicated for the Mechanics' Magazine and Register of Inventions and Improvements.]

Date	*Hours.*	*Thermometr.*	*Barometer.*	*Winds.*	*Strength of Wind.*	*Clouds from what direction.*	*Weather.*		*Remarks.*
Apr.30	6 a. m.	62	30·03	sw by w	light		cloudy	smoky	APRIL. Arithmetical mean of the thermometer for the month, 52°. Maximum height of the barometer in April, 30·40—Minimum, 29·42—Range, 0·98. The observations of winds at the surface, for the month of April, show the following results: From NE. including N. 22—from SE. including E. 26½—from SW. including S. 63½—and from NW. including W. 23. The observations of clouds or higher currents, also for the same month, are as follow: From the North-Eastern quarter, 4—from the South-Eastern, 3—from the South-Western, 65½—and from the North-Western, 28½.
	10	81	30·08	..	..	NW / WSW	fair	..	
	2 p. m.	83	30·07	..	..	NW	..	..	
	6	76	30·05	NE	fresh	..	..	..	
	10	61	30·15	..	strong	..	cloudy	..	
May 1	6 a. m.	56	30·21	NNE	moderate		foggy & cloudy	..	
	10	60	30·25	NE	..	NW	fair	..	
	2 p. m.	65	30·21	ENE	..	..	..	..	
	6	57	30·20	SSE	..	..	..	..	
	10	53	30·20	SE	..		cloudy	..	
" 2	6 a. m.	52	30·10	SSW	..		..	..	
	10	65	30·05	..	..		fair	..	
	2 p. m.	74	30·00	..	..	SW	..	..	
	6	69	30·05	SW	..	NW	..	..	
	10	63	30·12	..	..	..	..		
" 3	6 a. m.	48	30·25	N	..		clear		
	10	54	30·26	NNE—ENE	light		..		
	2 p. m.	60	30·28	S	..	SW	fair		
	6	56	30·21	..	..	..	..	smoky	
	10	53	30·26				..	..	
" 4	6 a. m.	48	30·28	SW—S	faint	WSW	..	..	
	10	57	30·32	SSE	moderate	..	..	..	
	2 p. m.	53	30·29	..	..	..	cloudy—rainy	..	
	6	51	30·26	..	..	..	rainy		
	10	48	30·22	..	..		cloudy		
" 5	6 a. m.	54	30·17	N	faint	NNW	..		
	10	55	30·19	NNW	light	..	..		
	2 p. m.	57	30·18	N by W	..	..	..		
	6	59	30·19	..	..	..	..		
	10	54	30·21				fair		

METEOROLOGICAL RECORD, KEPT IN THE CITY OF NEW-YORK—CONTINUED.

Date.	*Hours.*	*Thermometr.*	*Barometer.*	*Winds.*	*Strength of Wind.*	*Clouds from what direction.*	*Weather.*
May 6	6 a. m	49	30·22	NE	faint	SW	fair—cloudy smoky
	10	52	30·25	SSW	moderate	..	cloudy—fair ..
	2 p. m.	63	30·20	S	..	..	fair ..
	6	57	30·15	SSE	..	..	.. ..
	10	56	30·14				.. ..
" 7	6 a. m.	54	30·13	SW	light	..	.. ..
	10	64	30·13	S	..	..	.. ..
	2 p. m.	76	30·08	..	..	..	.. ..
	6	74	29·98	variable	..		cloudy—thunder storm
	10	65	30·05		fresh		rain [from 7 to 8
" 8	6 a. m.	63	30.00	SW	light		cloudy
	10	68	29·95	SSE	..	S	fair
	2 p. m.	78	29·92	..	..	..	..
	6	71	29·89	WNW	..	WNW	cloudy—showers
	10	67	29·91		..		..
" 9	6 a. m.	64	29·97	NNW	..		..
	10	77	30·00	NNE	..	W	fair
	2 p. m.	78	30·01	E	..	..	..
	6	60	30·09	ESE	fresh	..	..
	10	54	30·17	..	..	..	..
" 10	6 a. m.	51	30·20	SE	moderate	..	..
	10	60	30·23	ESE	fresh	..	..
	2 p. m.	63	30·21	ENE	strong	SW	cloudy
	6	52	30·20	..	..	..	.. —rainy
	10	51	30·20	..	..	..	rainy
" 11	6 a. m.	54	30·12	ENE—E	moderate	S	.. , thick scuds fr SW
	10	56	30·12	SE—SSE	..	SW	cloudy ..
	2 p. m.	62	30·09	S	..	..	.. ..
	6	63	30·09	..	..	..	fair ..
	10	62	30·10	..	..	..	cloudy—rainy ..
" 12	6 a. m.	63	30·10	SSE	..	..	.. ..
	10	66	30·11	..	..	WSW / SW	fair—cloudy ..
	2 p. m.	70	30·06	..	fresh	..	cloudy—fair
	6	65	30·03	..	..	..	.. — ..
	10	63	30·03	..	..	..	.. — ..
" 13	6 a. m.	63	30·02	..	..	..	fair
	10	68	30·01	..	moderate	..	.. occasional showers
	2 p. m.	74	30·01	..	light	..	..
	6	65	30·00	..	..	..	..
	10	63	30·03				..
" 14	6 a. m.	63	30·08	SE	..	S	rainy — Heavy freshets in the rivers.
	10	68	30·11	S by E	..	..	cloudy
	2 p. m.	73	30·07	S	..	..	..
	6	65	30·03	SSE	..	SE	fair
	10	63	30·04	..	..		..
" 15	6 a. m.	65	30·00	..	..		rainy
	10	68	30·03	N	..		..
	2 p. m.	72	30·07	NNE	..	SW / NNE	cloudy
	6	68	30·10	ENE	..	N	rainy
	10	66	30·12	..	..		cloudy
" 16	6 a. m.	59	30·18	NE	fresh		..
	10	59	30·16	..	..		..
	2 p. m.	58	30·15	..	strong	NNW	rainy
	6	52	30·15	..	..	..	..
	10	53	30·11	..	..		rain
" 17	6 a. m.	55	30·06	..	light		..
	10	61	30·05	..	..		cloudy
	2 p. m.	67	30·04	SSW	..	SW	fair
	6	64	30·01	..	..	..	..
	10	61	30·00	..	..		cloudy
" 18	6 a. m.	60	30.00	..	..	WSW	..
	10	66	29·98	..	moderate	..	..
	2 p. m.	76	29·88	..	..	W—NW	fair
	6	72	29·85	..	..	NW	..
	10	72	29·86	..	..		..
" 19	6 a. m.	70	29·85	SW	light	WSW	.. (cloudy
	10	76	29·87	SW by W	moderate	..	.. horizon mostly
	2 p. m.	82	29·86	WSW	..	..	.. ..
	6	76	29·88	..	..	WSW / NW	.. ..
	10	72	29·90	..	..		.. ..

Remarks.

MAY.

Arithmetical mean of the thermometer for the month, 62°.6.

Maximum height of the barometer, 30.37 in.—Minimum, 29.72—Range, 0.65.

The observations of surface winds for May give the following results: From the North-Eastern quarter of the compass, including N. 41¼—from SE. including E. 55½—from SW. including S. 32—and from NW. including W. 13.

The observations of the highest observed clouds, or currents, result as follows: From the North-East'n quarter, 3—from the South-Eastern, 3—from the South-Western, 77½—and from the North-Western, 28½.

The long drought which prevailed after the breaking up of winter terminated with showers on the 7th and 8th of this month. These showers were in many places accompanied by hail. Heavy rains succeeded, particularly from about the 11th to the 15th, by which the rivers were greatly swollen and much damage was sustained.—The rains have been general throughout almost every part of the United States, commencing a little earlier at the West and South, but have been heaviest in the interior of the middle and eastern States. Since the 8th instant, the month has been remarkably wet for the season. It is worthy of remark, that the Barometer has stood considerably above 30 inches during almost the whole period of these rains, even during the deluge which was experienced in the country from the 10th to the 15th—a fact which shows that the production of rain has no *necessary* connection with the sinking of the mercury in the barometer.

Note.—The position of the barometer is but eight or ten feet above the level of the sea, and its adjustment to the scale is accurate, or nearly so.

METEOROLOGICAL RECORD, KEPT IN THE CITY OF NEW-YORK—CONTINUED.

Date.	*Hours.*	*Thermometer.*	*Barometer.*	*Winds.*	*Strength of Wind.*	*Clouds from what direction.*	*Weather.*
May 20	6 a. m.	68	29·93	NE—ENE	moderate	WSW	fair—cloudy
	10	64	29·99	ENE—E	..	..	cloudy
	2 p. m.	62	29·95	E	..		.. —rain
	6	60	29·95	..	..		rain
	10	58	29·93	..	..		rainy
" 21	6 a. m.	56	29·77	ENE	..		cloudy and foggy
	10	58	29·79	..	..	SW	.. —thund. sh'r at 1
	2 p. m.	60	29·74	E—SSE—S	..	..	.. — do. at 4
	6	66	29·72	S	..	..	.. —fair
	10	63	29·76		..		fair high *cirri* fr ssw
" 22	6 a. m.	61	29·87	NNW	..	SSW	..
	10	67	29·93	..		SSW / NNW	..
	2 p. m.	76	29·95	WSW	light		..
	6	72	29·98	..	..	W by S	..
	10	67	30·00	..	..	..	..
" 23	6 a. m.	63	30·10	N—NE	..	WSW	..
	10	66	30·15	NE—S		..	cloudy
	2 p. m.	70	30·13	S—SSE	moderate	..	..
	6	67	30·13	SE	..	..	..
	10	63	30·18		..		..
" 24	6 a. m.	58	30·27	NE	..	..	fair with light cirrous
	10	62	30·34	ENE	..	WSW / NNE	.. clouds from wsw
	2 p. m.	67	30·37	E—ESE	..	WSW / NE	.. —cloudy
	6	63	30·37	ESE	..	WSW	cloudy
	10	58	30·34		..		fair
" 25	6 a. m.	55	30·27	ENE	..	SW-slow / E	cloudy—fair—rainy
	10	57	30·27	..	..	E	rain
	2 p. m.	58	30·18	..	fresh	..	..
	6	56	30·10	..	..		..
	10	56	30·07	..	..		..
" 26	6 a. m.	58	29·98	NNW	moderate	NNW	fair
	10	66	29·98	NW—SW	light	NW—W	..
	2 p. m.	74	29·89	SW	..	W	..
	6	71	29·87	SSE	..	W—NNW	..
	10	66	29·90	NNW	..	WNW	.. thick scuds fr E
" 27	6 a. m.	62	29·94	ENE	moderate	WNW / E	..
	10	66	29·98	E—ESE	..	W-W by S / ESE	.. —cloudy
	2 p. m	70	29·98	SE by E	..	WSW / ESE—E	cloudy
	6	65	29·98	ESE	..	SW / E	..
	10	61	29·30	E			rainy—rain
" 28	6 a. m.	59	30·03	ENE	..	ENE	.. , rain scud fr ENE
	10	60	30·09	..	..	..	..
	2 p. m.	61	30·10	NE	..	SW by W-slow / ENE	..
	6	62	30·11	ENE	light	.. / ..	altern'tely fair & cloudy
	10	62	30·10	..	..	.. / ..	cloudy
" 29	6 a. m.	59	30·05	..	..		.. —clear
	10	62	30·02	E—ESE	moderate		cloudy & foggy
	2 p. m.	65	29·92	SE	..		.. .. balloon
	6	60	29·85	..	..		.. .. ascension
	10	50	29·77	..	..		rainy—rain
" 30	6 a. m.	57	29·79	NW	mod.-fr'h	NW	fair, with light scuds fr NW
	10	63	29·85	WNW	fresh	WNW	..
	2 p. m.	67	29·88	WNW—W	..	SW by W / WNW	..
	6	66	29·89	W—WSW	light	SW by W	.. —clear
	10	60	29·92	WSW	..		clear
" 31	6 a. m.	56	30·02	..	..	SW by W	fair
	10	61	30·05	SW	moderate	..	..
	2 p. m.	72	30·05	SSW—SSE	..	..	..
	6	67	30·03	S	..	..	..
	10	62	30·04	..	..	SW by W / W	..

Remarks.

Mr. DURANT made an ascension with his balloon on the 29th. He left Castle Garden a few minutes after 5 o'clock, with the wind at *south-east*, and was out of sight from the Garden in 25 seconds, being enveloped with the clouds, which during most of the day were in contact with the earth's surface. In 6 minutes after leaving the earth he was above the clouds, *the heat had increased*, and he had clear sunshine, with a most magnificent prospect. On reaching the adjudged height of 16,000 feet, the cold became intense and he prepared to descend. On approaching the earth the noise of surf was heard, (probably from Hurlgate and its vicinity, where the tide of flood was running in its full strength,) the singing of birds was soon heard, and he landed about three quarters past 6 o'clock in Westchester county, eleven miles from the City Hall, three from the Hudson river and eight from the East river or Sound, which spot bears nearly *north-east* from the place of ascension.

It will appear from our record that on the previous day as well as at other recent periods, the upper current of stratum or clouds was observed moving nearly from west-south-west. It was this current which chiefly influenced the course of the balloon; and this ascension serves to strengthen the view which the writer has long entertained, viz. that during the cold winds and rains of our climate, particularly of the spring months, the warm and genial current of south-westerly winds, from the lower latitudes and the Gulf of Mexico, continues to move in its accustomed circuit without interruption, and forming, above the surface winds, a super incumbent stratum of no great elevation.